UNITED STATES DEPARTMENT OF AGRICULTURE
MISCELLANEOUS PUBLICATION No. 260

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A GRAPHIC SUMMARY OF PHYSICAL FEATURES AND LAND UTILIZATION IN THE UNITED STATES

By

O. E. BAKER
Senior Agricultural Economist
Bureau of Agricultural Economics

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This publication is one of a projected series of 10 publications as follows:

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This series, which has been prepared under the general direction of O. E. Baker, senior agricultural economist, will bring up to date the Graphic Summary of American Agriculture published in 1931 as Miscellaneous Publication 105.

The first Graphic Summary of American Agriculture appeared in the 1915 Yearbook of Agriculture (also issued as Yearbook Separate 681), and was largely based on the 1910 census. The second was contained in the 1921 Yearbook (also issued as Yearbook Separate 878), and was based largely on the 1920 census. The third was published as Miscellaneous Publication No. 105, in May 1931, and was based both on the 1925 Agricultural Census, and the annual estimates of the Bureau of Agricultural Economics. It was divided into 11 sections, but these sections were bound together and issued only as a single bulletin. It was more inclusive than previous issues, particularly of maps and graphs relating to the economic and social aspects of agriculture.

The publications in this series devote still more attention to economic and social conditions. They are based on both the 1930 and 1935 census reports, as well as the annual estimates of the Bureau of Agricultural Economics. They deal not only with changes between 1930 and 1935 but also, though very briefly, with the changes during the decade of urban prosperity and agricultural depression that preceded the more general depression. Most of the distribution maps for crops and many of those for livestock present the 1929 census returns, because the drought of unprecedented severity and extent in 1934 would make such maps for 1934 misleading. Several increase and decrease maps, however, show the changes that occurred between 1929 and 1934, or 1930 and 1935.

The graphic presentation was designed and drafted under the direction of R. G. Hainsworth, in charge of the Graphic Section of the Bureau of Agricultural Economics.

Most of the clerical work was done under the supervision of N. P. Bradshaw, who also prepared the indexes.

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By O. E. Baker, *senior agricultural economist, Bureau of Agricultural Economics*

INTRODUCTION

Several important trends in American agriculture were reversed during the recent depression. Three especially deserve notice:

(1) The trend in agricultural production, which was rapidly upward until 1926 and was stationary from 1926 to 1931, has been notably downward in recent years. Part of this reversal is attributable to drought, part to low prices for farm products, part to the program of the Agricultural Adjustment Administration, and part to depletion of soil fertility and to decline in rural wealth.

For many years not only the farmers but also the United States Department of Agriculture and the State colleges, experiment stations and extension services were proud of the part they played in increasing agricultural production. Now, with exports fallen to insignificant quantites, except in the case of cotton, tobacco, and certain fruits, and with the increase of population diminishing so rapidly that deaths seem likely to balance births in this Nation one to two decades hence, the whole situation is changed. The historian who looks on the last decade may find its events and developments to have signified a turning point in American history.

(2) The trend in farm population, which was downward from 1910 to 1930, has been upward during the depression. In 1 year at least, 1932, more people arrived on farms than left farms. The agricultural census taken January 1, 1935, reported 500,000 more farms than in 1930 and about 2,000,000 people on farms who were not living on farms 5 years before. These were the survivors of a larger "back-to-the-land" movement. Probably another million or more people, mostly farm youth, were backed up on farms who, under predepression conditions, would have migrated to the cities. The farm population in 1935 was about 1,600,000 larger than in 1930. Most of this increase took place in hilly regions or those having poor soils, for here the birth rate generally is high and land is cheap. Farm population increased notably also around the industrial cities. Apparently most of the increase in farms during the depression was of self-sufficing and part-time farms.

(3) For more than a century the trend has been toward increasing production per worker in agriculture. About 75 percent of all gainfully employed persons were engaged in agriculture in 1830 and less than 25 percent in 1930. Agricultural production per worker increased threefold, owing principally to the progress of agricultural settlement onto better lands (until about 1880) and to progress in technique, particularly increasing utilization of power. This trend has been reversed during the depression. Agricultural production in 1935 was about 10 percent less than in 1930 (perhaps half of which decline is attributable to the drought), whereas number of workers in agriculture increased probably between 5 and 10 percent. With most nonagricultural products persistently higher in price than agricultural products, relative to pre-war levels, it appears also that the standard of living of farmers has declined.

Is the reversal of these three fundamental trends permanent or transitory? Agricultural production probably will increase again for a time because two severe droughts in a 5-year period were extraordinary, as were the early restrictions of the program of the Agricultural Adjustment Administration, while the population of the Nation will increase, though more and more slowly, for at least 10 years to come. Agriculture may also become more commercial for a while, as prosperity promotes employment in the cities and migration from the farms increases. If net migration from farms exceeds the excess of births over deaths, the farm population will decrease. The predepression upward trend in production per worker seems likely to be resumed.

But looking beyond the next decade, a stationary and later a declining production as well as population appears probable, for production will not for long depart far from consumption; and the prospect for a notable increase in consumption per capita of foods and fibers is not bright, nor for exports of farm products. On the whole, it seems probable that after the middle of the century the trend will be toward a less commercial agriculture, particularly on the poorer soils.

PHYSICAL CONDITIONS

The physical conditions have been fundamental in determining the geography of American agriculture. These physical conditions became more important with the increasing commercialization of agriculture. The constant improvement in transportation facilities and the keen competition of producers in different regions make the production of a crop or animal product sensitive even to the minute advantages or disadvantages which a district may possess. They compel shifts in crop production or in use of land to be made with an alacrity unknown in the precommercial period. The control of the physical conditions over agricultural development, instead of being mitigated by the progress of science and commerce, has been intensified and enforced.

These physical conditions may be classified into four groups:

(1) Temperature and duration of the frost-free season (figs. 3–5).

(2) Moisture, of which the seasonal distribution of precipitation and the total annual amount are important (figs. 6–10).

(3) Topography, lay of the land, and degree and direction of slope (fig. 2).

(4) Soils, which are influenced greatly in their development by climate and the natural vegetation (figs. 11–19).

The moisture and temperature conditions relate primarily to the atmosphere, the topographic and soil conditions primarily to the surface of the earth, or what is commonly called the land. Moisture and temperature conditions jointly constitute the climatic factors. Likewise topographic and soil conditions may be said to constitute the edaphic factors. The climatic factors, in the extent and permanence of their characteristics may be compared to genera in botanical classifications; the edaphic factors of slope and soil, owing to the local variability and lesser permanence of their characteristics, may be compared to species. The climatic factors influence in particular the development of the general system of farming—dairying, cattle ranching, cotton growing, etc.—whereas the edaphic or local soil factors more often determine the best utilization for a particular piece of land—whether it should be used for crops, pasture, or forest, and, if suitable for crops, whether for wheat, potatoes, corn, etc.

These climatic and soil requirements of the crops are being altered by breeding cold- or drought-resistant varieties, and by the mechanization of agriculture, particularly along the arid margin of crop production. Mechanization reduces labor cost in crop production and permits a profit to be made on less productive land. But as weather conditions vary from season to season, and as the price of the product varies, and likewise the efficiency of farmers, the climatic boundary of a crop is never a precise line, but a zone commonly many miles in width. An edaphic boundary, on the other hand, is commonly sharp—often only a few feet in width.

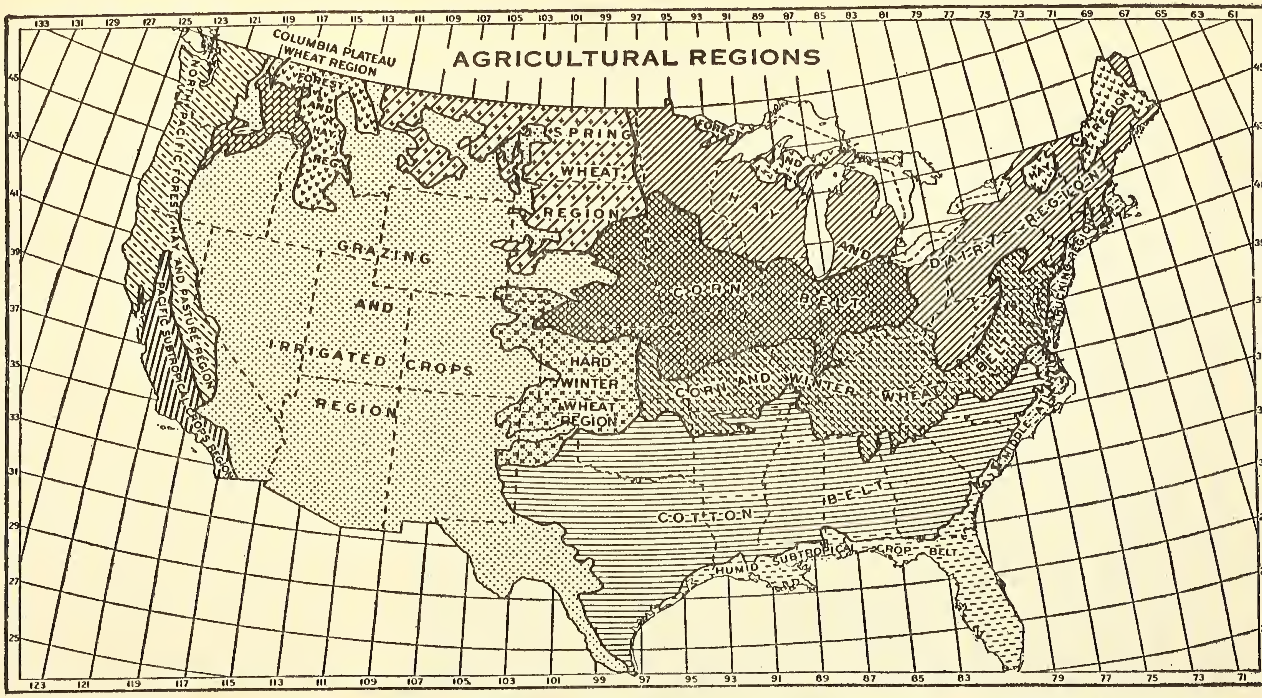

FIGURE 1.—The United States may be divided agriculturally into two parts, the East and the West, on the basis of the prevalent use of the land, whether for crops or for pastures. The dividing line approximates longitude 103°, except that it trends southeasterly in Texas and northwesterly in Montana. The East has mostly a humid or subhumid climate; the West an arid or semiarid climate, except in the North Pacific region, parts of the Columbia Plateau, and at the higher altitudes in the mountains. The East is divided into eight regions (excluding the Forest and Hay Belt) on the basis of the dominance of a certain crop or kind of farming, which is the result largely of latitude and temperature conditions. The West is divided into four regions on the basis of the use of the land for grazing or crops, which is determined largely by altitude and rainfall.

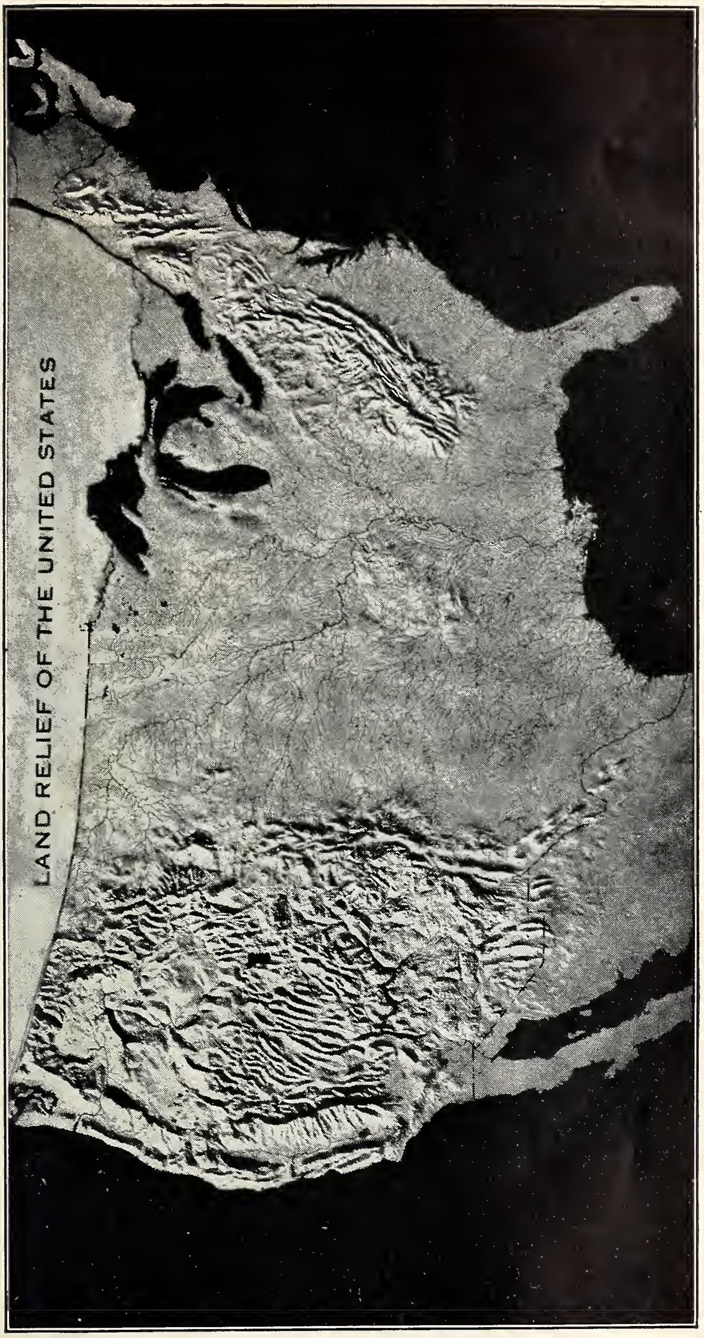

FIGURE 2.—This map shows the mountain areas of the United States in a generalized way. It is a photograph of a relief model of the United States supplied by the United States Geological Survey. The generally mountainous character of the West is clearly shown; but the photograph does not fully indicate the high altitude of much of the West, particularly of most of the Grazing and Irrigated Crops Belt. Owing to the altitude this region has a much cooler climate than corresponding latitudes in the East (fig. 3). The vast expanse of the Mississippi Valley, with its level-to-rolling surface, except for the Ozark uplift in the lower central portion, should be especially noted.

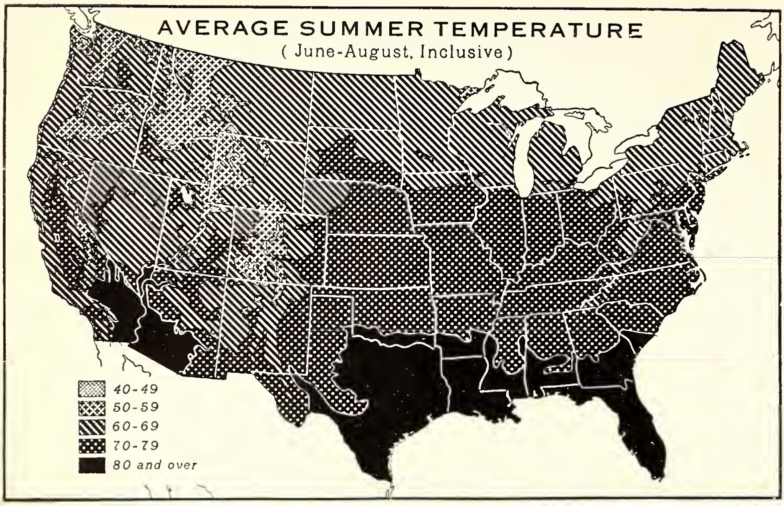

FIGURE 3.—Only a very small proportion of the land in the United States (not over 1 percent) has a summer temperature too cool for the production of the hardier small grains, potatoes, and hay. This land is located mostly in high mountainous sections where the surface, moreover, is too rough for cultivation. But temperature conditions restrict the production of several important crops. Practically no cotton is grown north of the line 77° F. average summer temperature, and very little corn is grown for grain north of 65°. The northern margin of the Corn Belt is 69° (in the West) to 70° (in the East). The cold margin for wheat is about 57° summer temperature, but for barley and potatoes it is possibly as low as 50°.

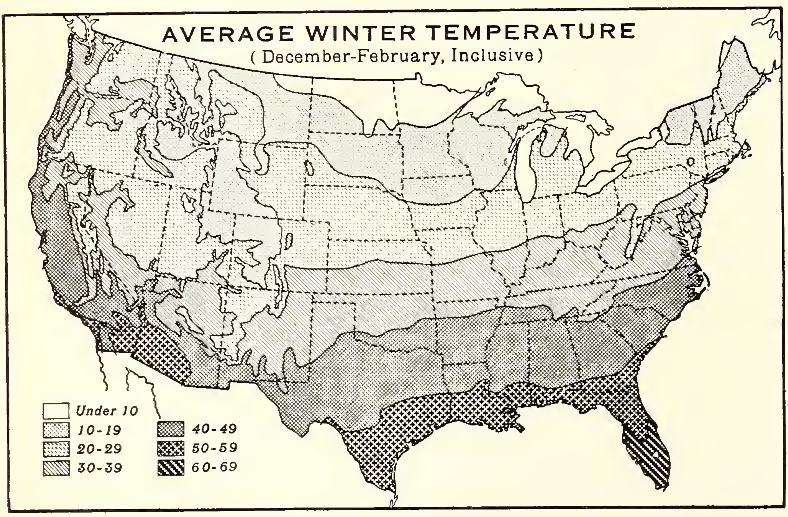

FIGURE 4.—The decrease in temperature with increase of latitude is much more rapid in winter than in summer, the difference between the Gulf coast and the Canadian border in Minnesota or Maine being about 50° F. in winter and 20° in summer. Moreover, whereas in summer the interior of the continent is warmer than the coast, in winter it is very much colder, the Pacific coast being 20° to 40° warmer than most of the Mississippi Valley at the same latitude, and the Atlantic coast about 10° warmer. Altitude is the third major influence, the decrease in temperature averaging about 1° for each 300 feet of elevation. After allowance is made for elevation, the Far West is much warmer than the East in winter.

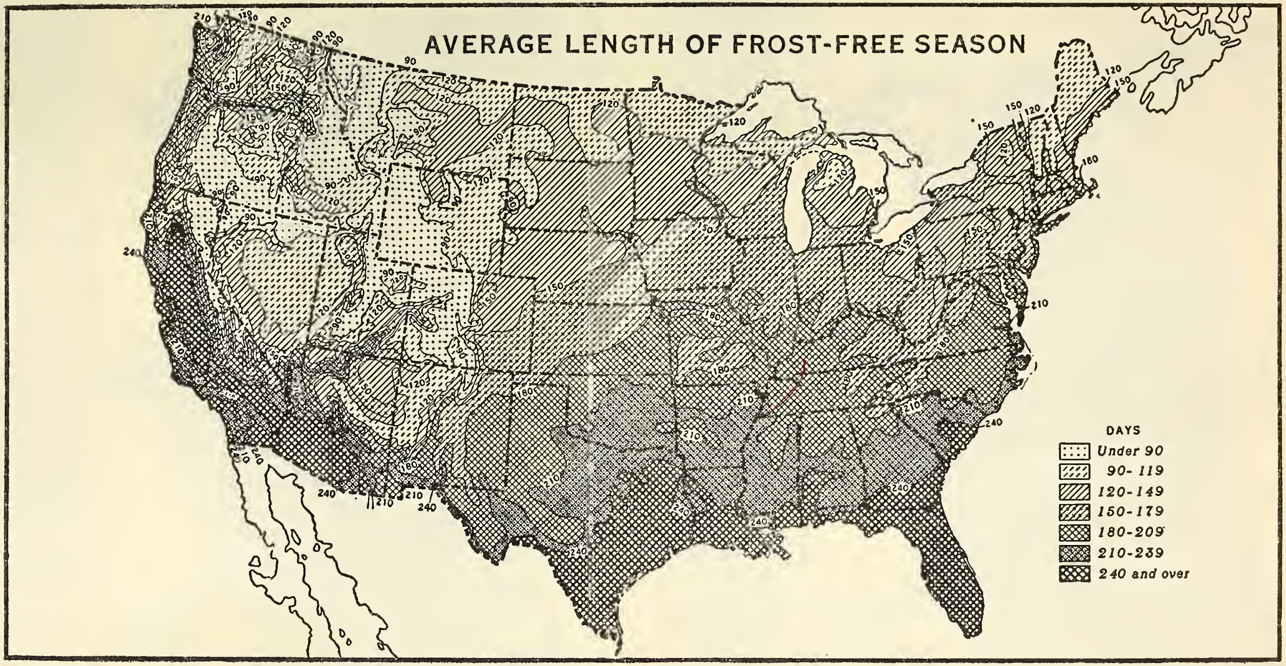

FIGURE 5.—This map is much reduced and generalized from a map prepared by the United States Weather Bureau and published in the Frost and the Growing Season section of the Atlas of American Agriculture. The higher altitude of much of the Grazing and Irrigated Crops Belt (fig. 2), and the drier air (fig. 8), which permits rapid loss of heat at night, are two important causes of the short frost-free season. Over much of this region the frost-free season is shorter than in northern Maine or Minnesota. The powerful influence of the Pacific Ocean and the lesser influence of the Atlantic Ocean in lengthening the frost-free season along their shores should be noted. No portion of the continental United States is entirely free from frost.

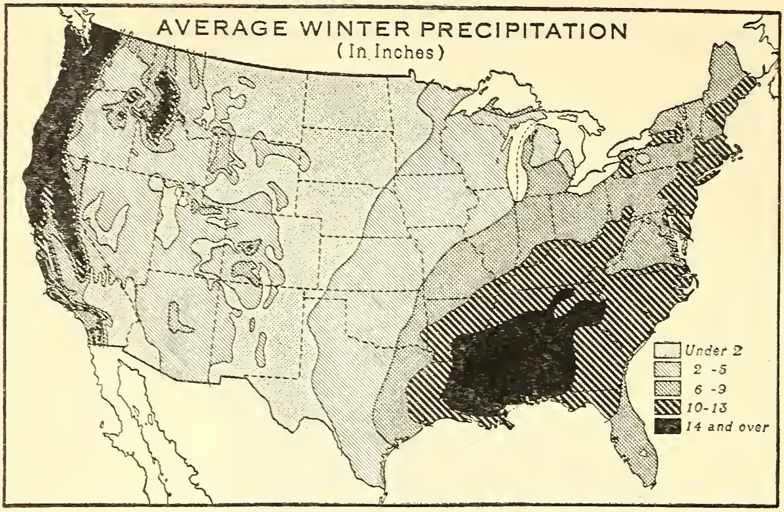

FIGURE 6.—West of the Rocky Mountains, except in Arizona, the winters are relatively wet and the summers are dry. In the Great Plains (short grass) and prairie (tall grass) regions, which together extend from the Rocky Mountains eastward to Minnesota, Illinois, and central Oklahoma, the winters are dry and the summers are relatively wet. In the Northeastern States the precipitation is more evenly distributed through the year, and this is true of the Southeastern States, except that the autumns are slightly drier. Especially significant are the light winter and relatively heavy spring precipitation in the spring wheat region; the heavy summer rainfall in the Corn Belt so essential to a large crop, and the light rainfall in the Cotton Belt in the autumn when the crop is being picked.

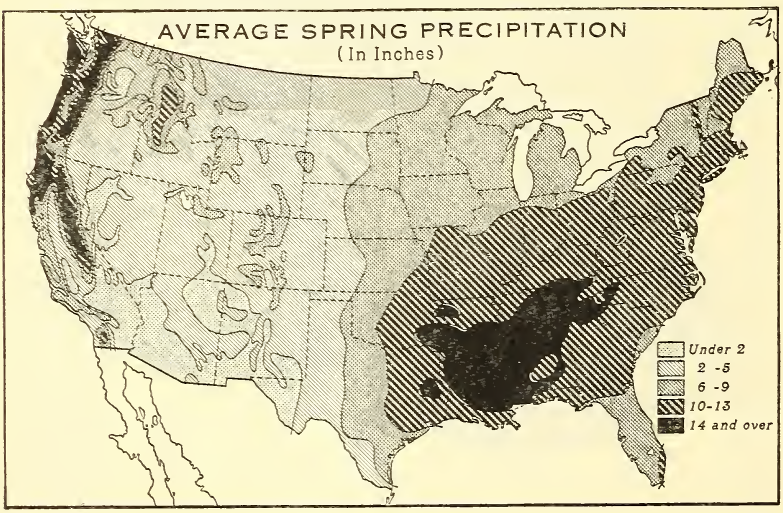

FIGURE 7.—The heavy winter rainfall along the Pacific coast continues during early spring, and this is true also of the northern Rocky Mountain region. In the Spring-Wheat Belt the rainfall increases markedly in late spring, and this is trus also in the western Corn Belt, the Hard Winter-Wheat Belt, and the western Cotton Belt. In the central Cotton Belt the spring rainfall is even heavier than the winter rainfall, and the rainfall is heavier in spring than in winter also in the eastern Corn Belt. In the Northeastern and Southeastern States the spring and winter precipitation is about equal in amount (10 to 14 inches). The local variations in average quantity of spring rainfall in New York State are wider than shown on the map—from about 6 inches to nearly 14 inches.

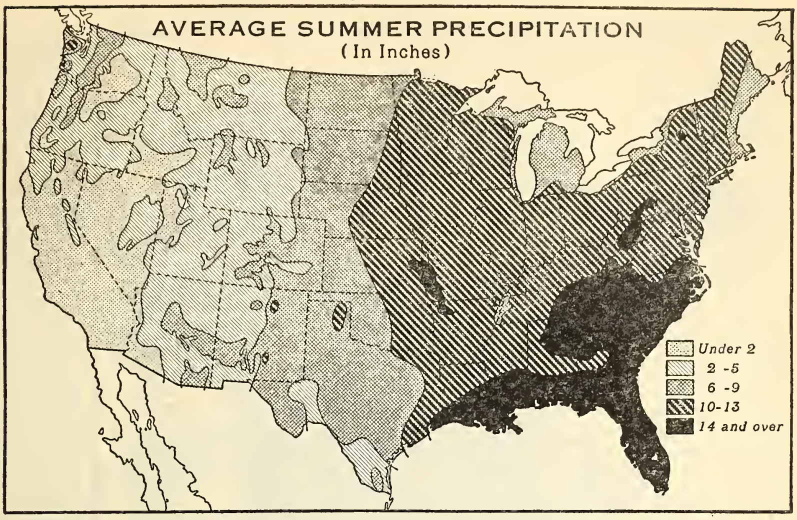

FIGURE 8.—In most of California and Nevada practically no rain falls in the summer months, except in the mountains, and there is very little rain in the Willamette Valley and the Puget Sound lowland. As far east as the crest of the Rocky Mountains the summer rainfall is light, except in the higher mountains. But in the Great Plains region, the Corn Belt, and the Southeastern States the rainfall increases to a maximum. It is due in large part to the heavy summer rainfall, so conducive to heavy corn yields, combined with the dry winters which promoted a grassland vegetation and conserved the fertility of the soil, that the upper Mississippi Valley is one of the richest agricultural areas in the world.

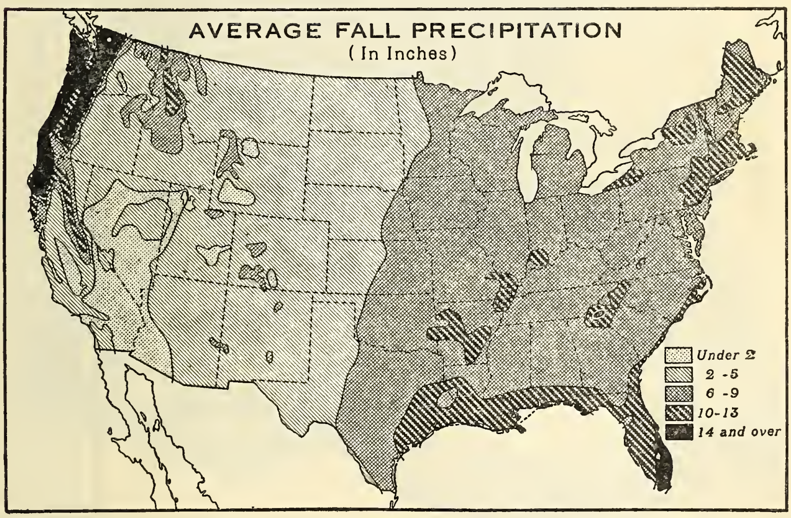

FIGURE 9.—In nearly all the Cotton Belt the autumn is the driest season of the year. Where the rainfall is heavy along the Gulf and South Atlantic coasts, little or no cotton is grown, partly because of damage to the lint and difficulty of picking, partly because of greater boll weevil infestation, and partly because of poorly drained or badly leached soils. The autumns are drier than the summers in practically all the rest of the United States east of Idaho and Nevada, and this favors harvesting of corn and the later cutting of hay, as well as the picking of cotton. Along the Pacific coast the rains begin again in the late fall, and are much heavier north of San Francisco than to the south.

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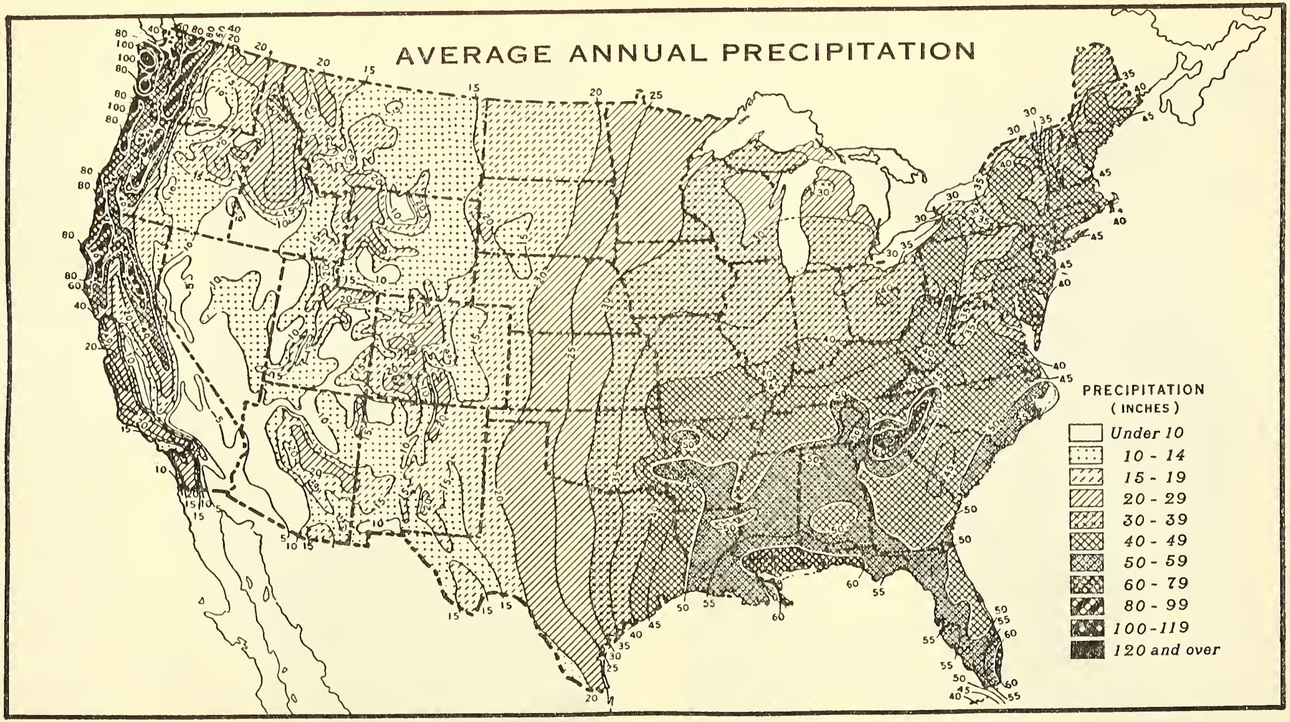

FIGURE 10.—Precipitation includes rain, melted snow, sleet, and hail. This map and the four seasonal maps preceding are much reduced and generalized from maps prepared by the Weather Bureau and published in the Precipitation and Humidity section of the Atlas of American Agriculture. The map suggests why the United States should be divided agriculturally into an eastern and a western part. However, the division shown in figure 1 does not follow a line of equal precipitation, but advances diagonally across two of the precipitation zones from 14 inches in the northeastern portion of Montana to about 24 inches on the south Texas coast, where, because the evaporation is much greater and the rainfall more torrential, more rainfall is required for crop production.

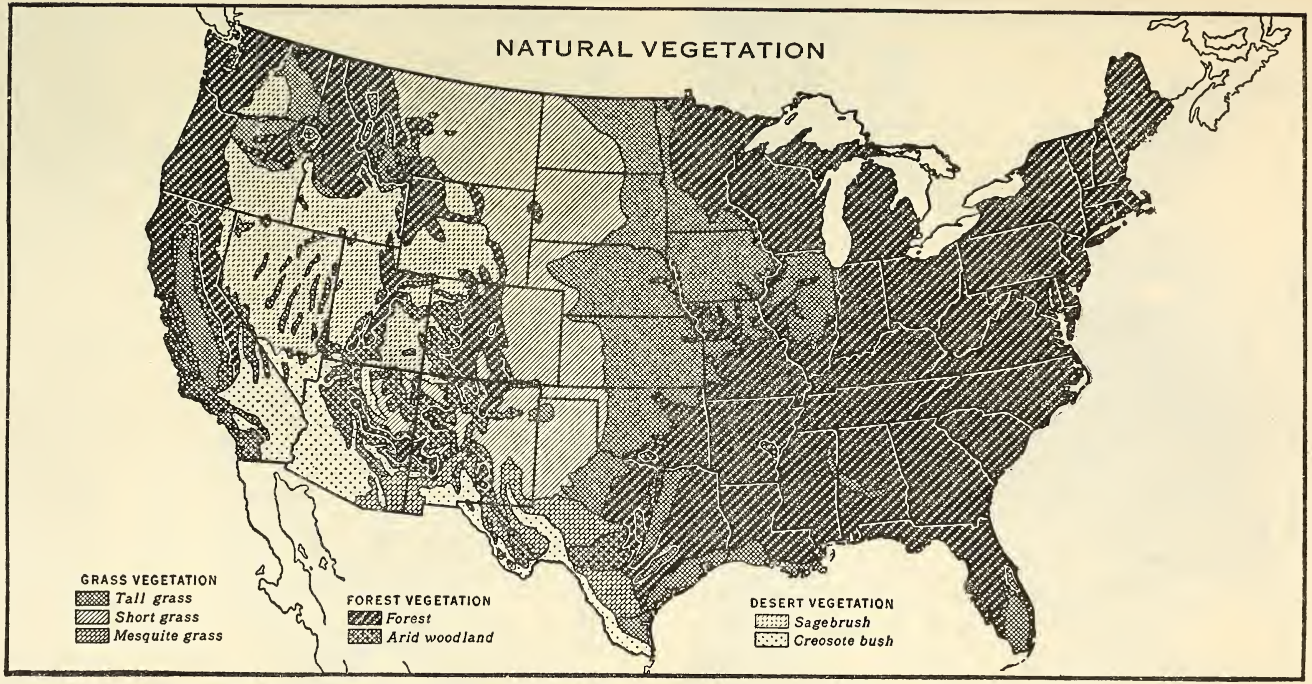

FIGURE 11.—Forests, excluding arid woodland (pinion-juniper and chaparral), originally covered about 800,000,000 acres in the United States. About 350,000,000 acres have been cleared for agriculture, and an even greater acreage has been cut over or devastated (fig. 50). About 50,000,000 acres once cleared have reverted to forest or brush. About 700,000,000 acres were clothed originally with grass, interspersed commonly with various herbaceous plants. Some 250,000,000 acres of this grassland have been plowed and used for crops, or for pasture in rotation with crops, including about 7,000,000 acres irrigated. About 35,000,000 acres of this former grassland lay idle in 1934. Desert vegetation characterized 400,000,000 acres, of which about 13,000,000 acres have been reclaimed by irrigation. More than half of the remaining forest and woodland is pastured, practically all of the grassland and nearly all of the desert. This map was prepared by the Forest Service.

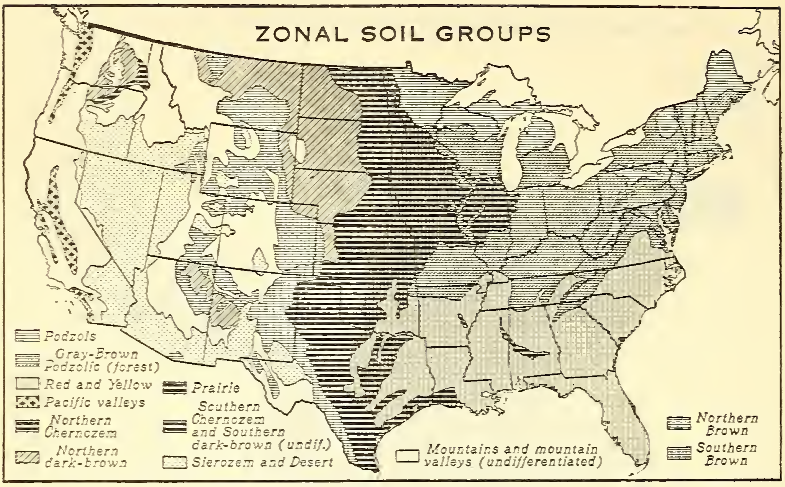

Figure 12.—Coniferous forests characterized the generally poor podzol soils in northern New England and the upper Great Lakes region, and some of this soil formerly cleared has reverted to forest. Broad-leaved deciduous forest characterized the fair-to-good gray-brown, podzolic soils of the East Central States. Here, aided often by fertilizers, a prosperous and permanent agriculture has developed. Mixed coniferous and deciduous forest characterized most of the poor-to-fair red and yellow soils of the South, and here population is pressing on the means of subsistence. The prairie, chernozem, and chestnut-colored soils are richer than the forest soils, but the rainfall is less certain, particularly in the chestnut-colored zone. These grassland soils produce most of the wheat and more than half of the corn and oats of the Nation. (Map by Bureau of Chemistry and Soils.)

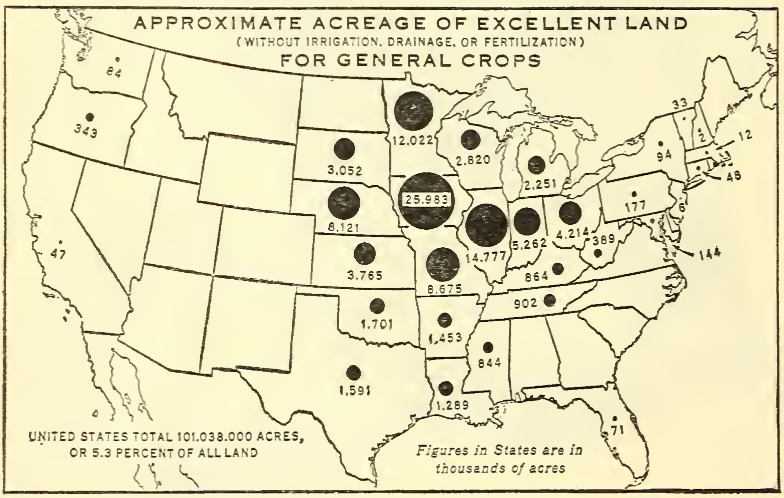

Figure 13.—Three-fourths of the 101,000,000 acres in the United States of excellent land for the production of the grains, grasses, and legumes (excluding irrigated and drained land and that improved by fertilization) are located in the Corn Belt, about 5,000,000 acres are in the Spring Wheat Belt, another 5,000,000 acres in the Winter Wheat Belt, nearly 5,000,000 more in the Dairy Belt, mostly in the Lakes States, and 4,000,000 acres in the Mississippi and other river bottoms of the central Cotton Belt and Subtropical Crops Belt. Practically all the remainder is found in the bluegrass districts of West Virginia, Kentucky, and Tennessee, the black prairies of Texas and Oklahoma, and scattered, mostly in small areas, in the Pacific Coast States. (Preliminary estimate by Bureau of Chemistry and Soils.)

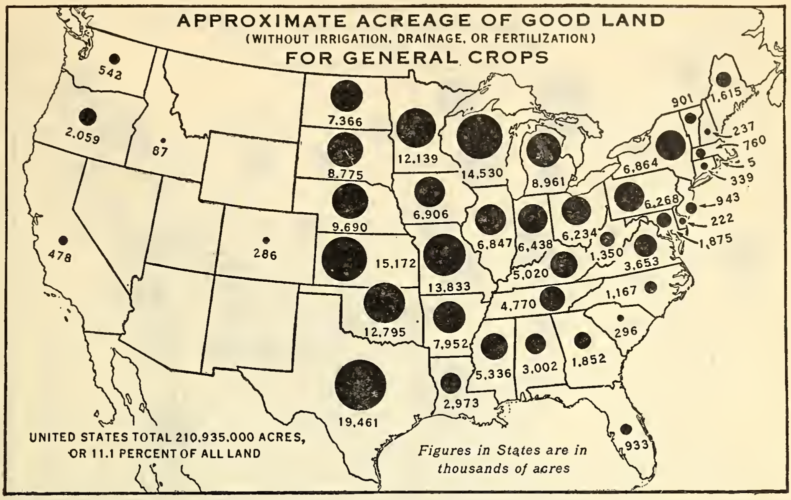

FIGURE 14.—One-third of the 211,000,000 acres of good land for the production of the grains, grasses, and legumes (without irrigation, drainage, or fertilization) is located in the States from Texas to North Dakota, almost wholly in the grassland portions; one-fourth in the dairy States extending from Minnesota to Maine and Maryland; one-fifth in the Corn Belt States of Iowa, Missouri, Illinois, Indiana, and Ohio; one-fifth in the South, excluding Texas and Oklahoma, but including Tennessee, Kentucky, and the Virginias; and only one-sixtieth in the 11 Far Western States, mostly in the Pacific region. This small extent of good land in the West is due to deficiency of rainfall rather than to infertility of the soil. (Preliminary estimate by Bureau of Chemistry and Soils.)

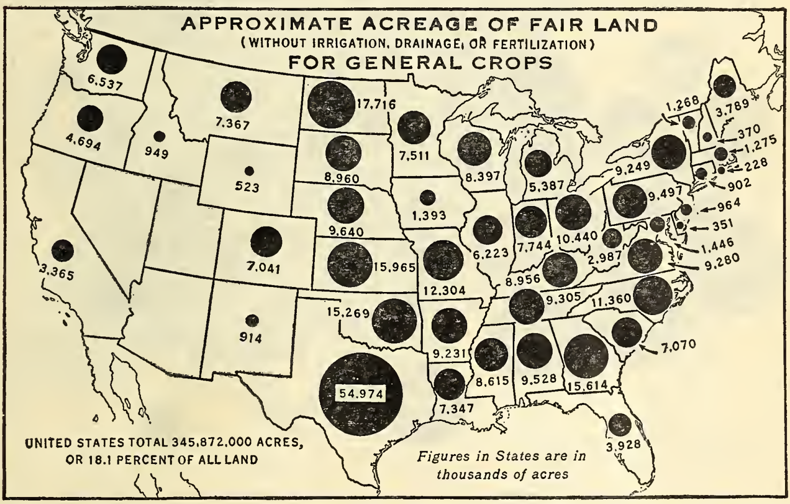

FIGURE 15.—Land of fair fertility in its original condition is found in nearly all the States, but one-half of the 346,000,000 acres is located in the South, that is, in the States south of the Potomac and Ohio Rivers and including Arkansas, Louisiana, Oklahoma, and Texas. Nearly one-sixth of this fair land is in the Dairy Belt from Minnesota to Maine and Maryland; one-eighth in the Corn Belt States, mostly in their poorer marginal areas; one-tenth in the spring-wheat States of the Dakotas and Montana, and nearly one-twentieth in Kansas. Nearly all the remainder is located in Colorado and the Pacific Coast States. In the Western States this classification as fair land is due generally to low or precarious precipitation rather than to defects in the soil. (Preliminary estimate by Bureau of Chemistry and Soils.)

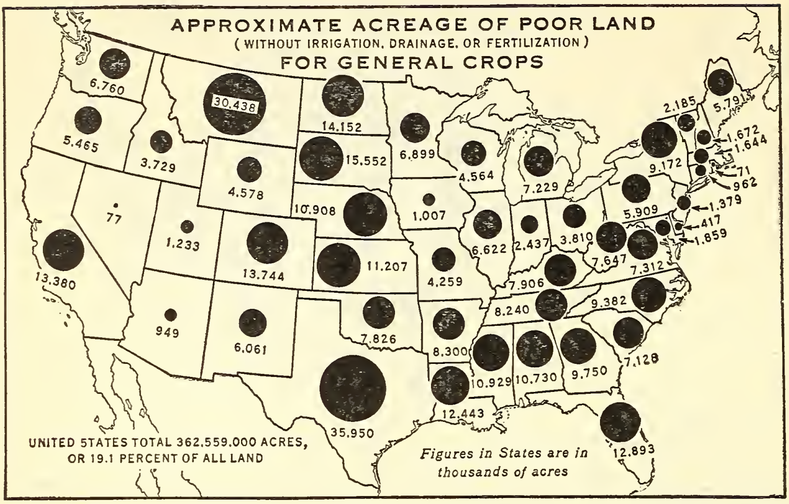

FIGURE 16.—There is more poor land (in its original condition) than fair land in the United States, and more land of fair fertility than of good and excellent land combined. About 43 percent of the poor land is located in the Southern States, one-fourth in the Spring- and Hard Winter-Wheat regions, and western Corn Belt (in these regions most of the deficiency is due to moisture rather than to soil) and one-sixth in the dairy States from Minnesota to Maine and Maryland. Most of the remaining acreage is located in the Far Western States. The area of poor land in the central and eastern Corn Belt is small. (Preliminary estimate by Bureau of Chemistry and Soils.)

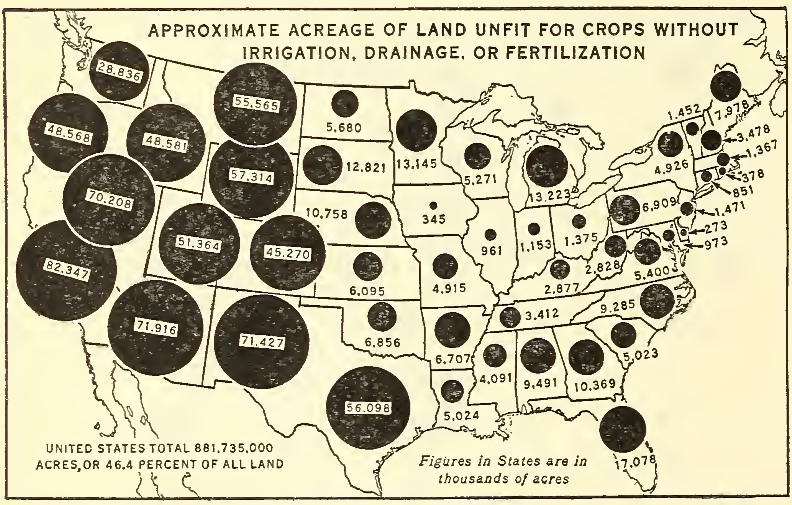

FIGURE 17.—Nearly three-fourths of the 881,000,000 acres of nontillable land of the United States is located in the 11 Far Western States, and about 10 percent more in the arid and semiarid portions of the adjacent Great Plains States. Deficiency of water rather than topographic or soil conditions prevents the cultivation of most of this land. But in the South, excluding Texas and Oklahoma, there are about 80,000,000 acres of land too poor or too rough to cultivate, and in the North, excluding the States from Kansas to North Dakota, there are about 70,000,000 acres, located mostly in the Appalachian Mountain region and in the northern portions of the Lakes States. Over 46 percent of the land in the United States is classified as "essentially incapable of tillage." (Preliminary estimate by Bureau of Chemistry and Soils.)

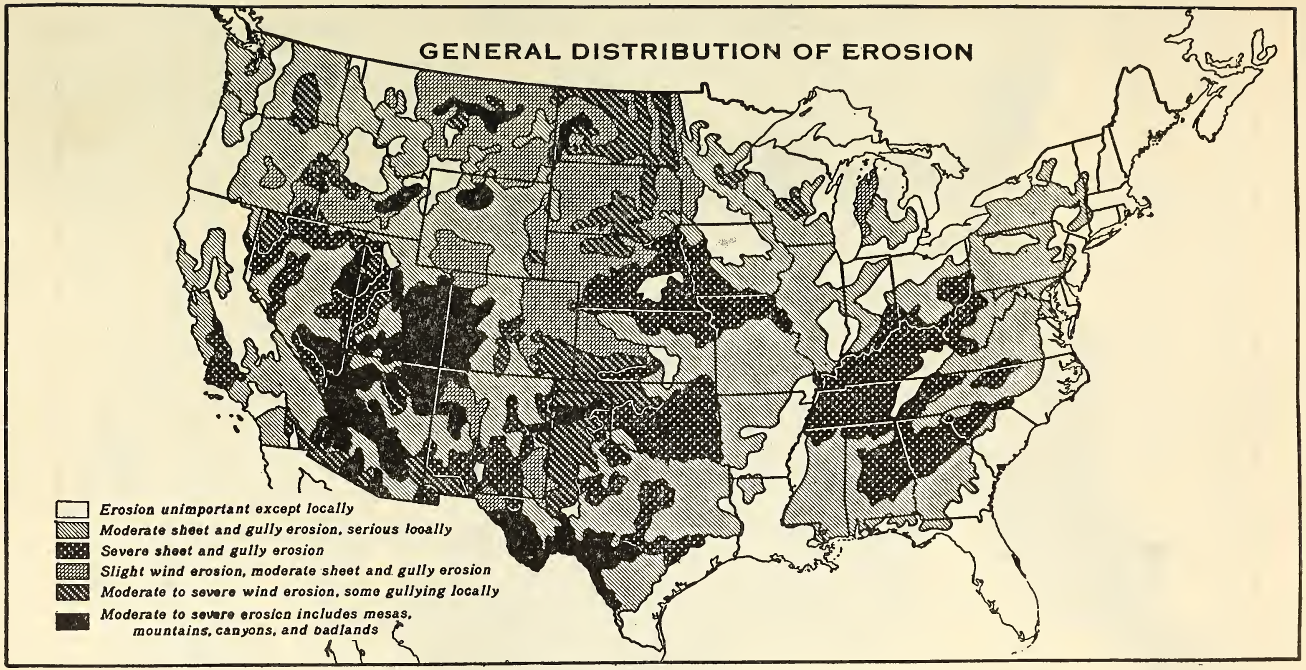

FIGURE 18.—Of the 500,000,000 acres used for crops in the United States, including summer fallow and pasture in rotation with crops, about 50,000,000 acres are so severely eroded that they should not be used for intertilled crops, such as corn and cotton, but should be kept, instead, in hay or pasture. About 100,000,000 acres are moderately eroded—that is, have lost much of their topsoil—but can be cultivated without great injury by methods that retard erosion. Another 100,000,000 acres are slightly eroded. These can be cultivated with little or no injury by using proper practices. The seriousness of the situation is shown by the fact that about 50,000,000 acres of formerly cultivated land—an area equal to the crop land of New England, New York, Pennsylvania, New Jersey, Delaware, Maryland, the Virginias, the Carolinas, and Georgia—has been rendered essentially incapable of cultivation by gullying and other forms of soil removal. (Compiled by Soil Conservation Service.)

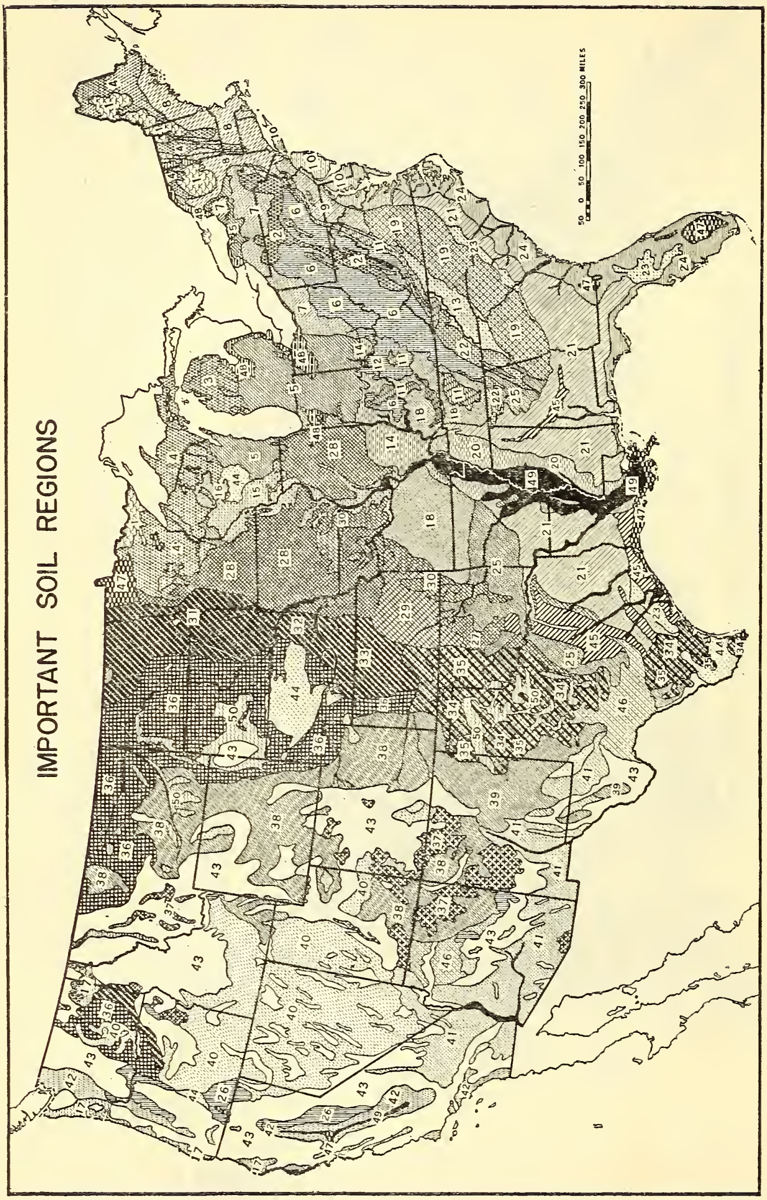

FIGURE 19.—See opposite page for legend.

LEGEND FOR FIGURE 19

The map on the opposite page is schematic. Each soil region outlined includes associated soils developed under a relatively uniform environment. The names in parentheses refer to the more extensive or representative soil series in the respective regions. (Map and legend by Bureau of Chemistry and Soils.)

PODZOLS

The profile consists of a very thin organic layer above a gray leached layer which rests upon a dark-brown or coffee-brown horizon. The Podzol is developed usually under a coniferous forest in a cool moist climate. Its inherent productivity for crop plants is low. The figures below refer to the area numbers on the map on the opposite page.

1. Rough stony land, including areas of shallow Podzols.
2. Chiefly loams and silt loams, developed from sandstones and shales of the plateau and mountain uplands. Includes the Leetonia and the Dekalb soils.
3. Dominantly sands and loamy sands, developed on glacial drift. (Roselawn, Kalkaska.)
4. Dominantly loams and clay loams, developed on glacial drift. (Hermon, Ontonagon.)

GRAY-BROWN PODZOLIC SOILS

The profile has a rather thin organic layer over grayish-brown leached soil which overlies a brown horizon. The soils are generally acid, at least in the surface. These soils develop in a moist and cool-temperate climate under a deciduous forest and are inherently more productive than the Podzols.

5. Dominantly loams and silt loams, developed on calcareous glacial drift. (Miami, Crosby, and Honeoye—Ontario associations.)
6. Brownish-yellow silty loams or stony loams with hilly relief developed on sandstones and shales. (Muskingum, Zanesville, Westmoreland.)
7. Loams and silt loams, developed on acid glacial drift, composed of sandstones and shale material. Some of these soils are imperfectly drained. (Canfield, Volusia, Lordstown.)
8. Dominantly stony and gravelly loams, developed on glacial drift. (Gloucester, Troy.)
9. Loams and silt loams, developed mostly on the crystalline rocks of the northern Piedmont. (Chester, Manor, Penn.)
10. Largely sandy loams developed on the sands and clays of the northern Coastal Plain. (Sassafras, Collington.)
11. Chiefly brown silt loams, developed on limestone. (Hagerstown, Maury, Frederick.)
12. Shallow soils developed on interbedded limestone and calcareous shales. (Fairmont, Lowell.)
13. Loams and stony loams from granitic material with hilly to mountainous relief. (Ashe, Porters.)
14. Silt loams with heavy clay subsoils, developed on Illinoian glacial till. (Gibson, Cory, Clermont, Rossmoyne.)
15. Silt loams, developed largely from loess. (Clinton, Fayette.)
16. Imperfectly drained grayish silt loams with silty clay loam subsoils, developed from acid glacial drift. (Spencer.)
17. Largely loams and silt loams with yellowish subsoils, developed from sandstones and shales. (Melbourne.)
18. Grayish-yellow to reddish silt loams and cherty silt loams, developed from cherty limestones. (Clarksville, Dickson, Baxter.)

RED AND YELLOW SOILS

This group of soils consists of two general types of profiles which are very intimately associated. Both have thin organic layers. The profile of the Red soil is a yellowish-brown leached layer over a red horizon while the profile of the Yellow soil is a grayish-yellow leached layer over a yellow horizon. Both developed under the forest in a moist, warm-temperate climate. Generally the yellow profile is more pronounced under the coniferous forest and the red under the deciduous forest. The inherent fertility of the Yellow soils is generally relatively low and that of the Red soils, medium.

19. Dominantly brownish-red clay loams and gray sandy loams, developed largely from crystalline rocks of the southern Piedmont. (Cecil, Durham, Appling, Georgeville, Davidson.)
20. Yellow to light-brown silt loams, developed on loess. (Memphis, Grenada.)
21. Dominantly gray to yellow sandy and fine sandy loams, with some sands and fine sands, developed from Coastal Plain materials. (Norfolk, Ruston, Orangeburg.)
22. Largely brownish-red to red silt loams and clay loams, developed from limestone. (Dewey, Decatur, Fullerton.)
23. Grayish-yellow to light-brown sands and fine sands of the Coastal Plain. (Norfolk sands.)
24. Grayish fine sandy loams, with some gray or black loams, developed in the flatwoods area of the Coastal Plain. Includes areas underlain by coralline limestone. (Coxville, Leon, Portsmouth.)
25. Grayish-yellow to reddish fine sandy loams and silt loams, developed from sandstones and shales. A considerable portion is hilly and stony. (Hartsells, Hanceville, Conway.)
26. Red soils of the north Pacific slopes. (Aiken, Sierra, Sites.)

PRAIRIE SOILS

The profile of the Prairie soil grades from a very dark brown or dark grayish-brown surface through brown to lighter colored parent material at a depth from 2 to 5 feet. It is developed in a moist temperate climate under a tall-grass prairie. Inherent fertility for crop plants is high.

27. Reddish-brown soils of variable texture, developed on sandstones, shales, clays, and sands. (Zaneis, Renfrew.)
28. Dark-brown silt loams with yellowish-brown subsoils, developed on glacial drift and loess. (Carrington, Tama, Clarion, Marshall.)
29. Dark-brown to reddish-brown silt loams and clay loams, developed from limestone and calcareous shales. (Summit, Crawford.)
30. Dark-brown or grayish-brown silt loams, having heavy subsoils or claypans. (Cherokee, Parsons, Grundy, Putnam.)

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NORTHERN CHERNOZEM

The profile has a black or dark grayish-brown surface soil grading below into light-colored material which is calcareous at 2 to 6 feet. It is developed in a temperate to cool, subhumid climate under tall and mixed grasses. Inherent productivity is high.

31. Black loams, silt loams, and clay loams, developed on calcareous glacial drift and associated lacustrine deposits. (Barnes, Bearden, Fargo.)
32. Dark grayish-brown loams and silt loams, developed from loess. (Moody, Holdredge.)
33. Dark grayish-brown silt loams with claypans, developed from loess. (Crete, Hastings.)

SOUTHERN CHERNOZEM—DARK-BROWN SOILS

The profiles have dark-brown to reddish-brown surface soils underlain by brown or red horizons, grading below into light-colored material which is calcareous at 3 to 6 feet. These soils develop in a warm, subhumid to semiarid climate under a mixed tall- and short-grass prairie.

34. Heavy or moderately heavy dark-brown soils, developed from calcareous materials. (Pullman, Abilene, Victoria.)
35. Predominantly red and brown sandy loams and sands, developed largely from unconsolidated calcareous sands, silts, and sandy clays. (Amarillo, Miles, Duval.)

NORTHERN DARK-BROWN (CHESTNUT) SOILS

The profile grades from a dark-brown surface soil into a whitish calcareous horizon at a depth from 1½ to 3 feet. These soils develop under mixed tall and short grasses in a temperate to cool semiarid climate.

36. Dark-brown soils developed on unconsolidated, calcareous sands, silts, and clays. (Scobey, Rosebud, Keith, Walla Walla.)
37. Dark-brown soils, developed upon heterogeneous material associated with mountainous and plateau terrain.

BROWN SOILS

A brown surface soil grading at a depth, ranging from 1 to 2 feet, into a whitish calcareous horizon. The profile is developed in a temperate to cool, semiarid climate under short grasses, bunch grasses, and shrubs.

38. (Northern) chiefly brown loams, developed largely on unconsolidated sands, silts, and clays. (Joplin, Weld.)
39. (Southern) chiefly light-brown to gray fine sandy loams to silty clay loams of smooth relief, developed largely on limestone or unconsolidated sands, silts, and clays. (Uvalde, Reagan.)

SIEROZEM AND DESERT SOILS

Grayish and reddish soils, closely underlain by calcareous material. These soils develop in an arid climate under short-grass and desert plants.

40. (Northern) gray and grayish-brown soils of variable texture, developed largely on loess and alluvial fan material. (Ritzville, Portneuf.)
41. (Southern) gray, brown, and reddish soils of variable texture, developed largely on alluvial fans. (Reeves, Mohave.)

SOILS OF THE PACIFIC VALLEYS

42. Includes a number of variable zonal, azonal, and intrazonal soils which are too intimately associated to separate on a schematic map. These soils are developed under a range of climatic and geological conditions. (San Joaquin, Fresno, Hanford.)

INTRAZONAL AND AZONAL SOILS

These soils may possess one of two general types of profile: (*a*) The profile may express a local condition as drainage or parent material rather than the zonal profile of the region; (*b*) the profile may be too immature to express a zonal type.

43. Rough and mountainous (azonal).
44. Largely azonal sands, some of which are associated with bogs. (Valentine sand, dune sand, etc.)
45. Black (or brown) friable soil underlain by whitish material excessively high in calcium carbonate. These soils develop under a prairie vegetation and are known as Rendzinas (intrazonal). (Houston, Sumter.)
46. Shallow stony soils from limestone (azonal). (Valera, Ector.)
47. Marsh, swamp, and bog (intrazonal). (Carlisle, Pamlico, Rifle.)
48. Soils, largely intrazonal, developed upon lake plains. (Brookston, Maumee, Vergennes.)
49. Alluvial soils (azonal). (Huntington, Sharkey, Columbia, Cass.)
50. Rough broken land, including Pierre soils.

LAND UTILIZATION

The ratio of land resources to population in the United States is very large compared with many other countries of the world. Prior to the recent depression and droughts, nearly 3 acres of crops were harvested per person in the United States, as compared with 1 acre in Germany, one-half acre in China, and one-fourth acre in Japan. Most of this agricultural production in the past and nearly all at present is consumed within the United States, the per-capita requirement being about 2.5 acres. This includes 0.4 of an acre per head required to feed horses and mules used in the production process.

This high ratio of resources to population has two serious consequences—there is a tendency to produce more than can be purchased at a fair price, and there is a tendency to let the soils waste away by erosion and other forms of depletion. The tendency to produce beyond the capacity of the people to purchase has led to the agricultural-adjustment program, with its objective of a balance between production and consumption; and the tendency toward soil depletion has led to the development of the Soil Conservation Service, and the orientation of the agricultural-adjustment program to include the conservation of soil resources.

In considering these profound changes in agricultural objectives—from promotion of production to the control of production and conservation of resources—it seems desirable to note very briefly the physical conditions associated with the use of land for crops, for pasture, and for forest. But the pressure of economic forces on these physical conditions varies with time, hence maps have been included that indicate, in a general way, some of the changes which occurred during the decade 1910–19, years in which agriculture was greatly affected by the World War; then the changes that occurred during the decade 1920–29, with its notable progress in agricultural technique, particularly in the substitution of mechanical for animal power; and, finally, the reversal of many trends during the economic depression of 1930–35.

SOME PHYSICAL CONDITIONS AFFECTING THE AGRICULTURAL USE OF THE LAND

The principal agricultural uses of land are for crops, for pasture, and for forests. But much land is used for crops in some years and for pasture in other years, or for both crops and pasture in the same year; also much land is used simultaneously for pasture and for forest. The separation of land into these three classes is made, therefore, on the basis of the major or most important use. As the value of the crop is, with rare exceptions, greater than the value of the pasture, land used during the same season for both crops and pasture is usually classified as crop land. Similarly, when land in forest is also used for pasture, it is normally classified as forest land. In both cases the use of the land for pasture is likely to be incidental.

CROP LAND

The physical conditions which limit crop production are different from those which limit the use of land for pasture and for forest. Crop plants produce, in general, products of greater value annually per acre than pasture or forest plants—they have been selected because of

high productivity, usually of food or fiber, and have been bred for centuries with this end in view. Partly because of this prolonged breeding for high productivity, crops require ordinarily more favorable physical conditions than pasture or forest plants and the environment usually has to be modified by man in order to assure satisfactory returns—crops must be protected, cultivated, and often fertilized. Were man's protecting care withdrawn, few if any of our common crops would survive for 10 years the severe struggle for the use of the land to be seen everywhere in nature.

The plants used for crops, in general, are larger and in order to attain maturity must make a more rapid growth than the pasture plants. Hence, crops are excluded from much of the arid and semiarid lands of the West, the moisture requirement for wheat and the grain sorghums, probably the two most drought-resistant crops, varying from about 10 inches to 30 inches, according to the rate of evaporation, the seasonal occurrence and character of the rainfall, and the soil conditions. The temperature requirements of the crops also are higher than those of some pasture plants. Whereas pasturage extends often to the very tops of the mountains in Colorado, potatoes and barley are grown only up to 9,000, rarely 10,000 feet elevation, where the mean summer temperature is about 54° F. Crops, moreover, cannot well be grown on stony land, because the stones interfere with plowing, nor permanently on steep slopes, because the loosened soil gradually washes away. Such stony or rough land, on the other hand, may be well adapted to forest. Finally, there are large areas of sandy land that it does not pay to fertilize, because of location or other unfavorable conditions, and which, meanwhile, are not suitable for crop production.

Thus, crops are excluded by insufficient moisture from over one-fourth of the United States. This land is utilized almost wholly for pasture. They are excluded by deficient temperature from an appreciable extent of land lying at higher altitudes in the West. This land is utilized for both pasture and forest. By rough or hilly topography crops are excluded from perhaps one-seventh of the Nation's land. This is utilized largely for forest. Finally, crops are excluded by infertile soils from considerable areas in several States, which soils are, in general, fit only for forest. Only about one-half the land in the United States is physically available (without irrigation or drainage) for crop production, and less than one-half of this is used for crops.

FOREST LAND

Forests consist of perennial plants, hence they must endure the climatic and other vicissitudes not only of the summer but of the winter season also, not only of one but of many years. Moreover, trees present an exceptionally large and exposed extent of surface to evaporation; hence forests, in general, are more restricted than crops in the matter of moisture requirements. But forests are less restricted by low temperatures, and are scarcely restricted at all by topographic and soil conditions. Forest trees not only possess more permanent root systems than most crops or pasture plants, but the roots also usually penetrate deeper; while the mulch of decaying leaves and litter that accumulates on the ground and the leafy branches above that break the velocity of the beating rains of summer, all contribute to

render forests peculiarly adapted to sites subject to erosion, such as mountain slopes and districts of torrential rainfall.

The western limit of the vast forest area which originally covered most of the humid eastern portion of the United States crossed the Canadian boundary into eastern North Dakota where the average annual precipitation is 20 inches, thence extended southeastwardly to Illinois and then southwestwardly to Oklahoma and eastern Texas, where the forest margin corresponds more or less closely with the rainfall line of 35 inches. The pine forests of the West, however, have a much lower rainfall requirement. These forests extend down the mountain slopes usually to the zone where the average annual rainfall is about 18 inches. In the matter of resistance to low temperatures some forest trees, especially the spruce and fir, exceed any of the crops. Whereas 9,000 to 10,000 feet is the upper limit of crop production in Colorado, the timber extends upward to 11,000 and 12,000 feet. The mean summer temperature at this altitude is about 48° F.

Finally, with reference to stony or rough land and sandy soils in humid areas, forests show almost perfect adaption. Mountain slopes will produce almost as much timber as valley bottoms having the same soil, and the land meanwhile is being protected from erosion. Likewise relatively infertile sand will normally produce as many feet of pine timber annually as the most fertile land will of hardwood. For these reasons the mountain areas and the sandy lands of the United States, which jointly amount to about 400,000,000 acres, are devoted largely to forest. About 350,000,000 acres of forest land have been cleared for crops and pasture, but probably 50,000,000 acres of formerly cleared land have reverted to forest and brush, and about 25,000,000 acres are used for roads, railroads, cities, golf courses, etc.

PASTURE LAND

Pasture includes both the tame and naturalized grasses and legumes of the humid East and the wild grasses and herbs that grow on the plains and deserts of the West—a vast variety of plants having the one common characteristic of being grazed by livestock. Some of the pasture plants are annuals, some are perennials, some are bulbous and able to survive long periods of drought, and some propagate by rootstalks as well as by seed. Hence, it is to be expected that pasture will be adapted to a wider range of climatic conditions than either crops or forests. The hot deserts of the Southwest, even where the annual rainfall is only 6 inches and there are occasional years without any rain, are grazed in winter by roving bands of sheep, while in summer the same sheep may be driven up to graze on the cool mountain-top meadows above timber line, where the mean summer temperature is only 45° F.

Pasture is not only the sole means of utilizing most of the arid land of the West, but also it tends to replace crops in cool regions of heavy and frequent rainfall, such as the North Pacific coast, particularly if the pasture season is long. In regions of heavy rainfall and high temperatures, on the other hand, like the South Atlantic coast, the use of land for crops is much more important than for pasture. Moreover, pasture is often the only means of utilizing semiarid, stony, or rough land, as well as poorly drained muck lands and peat bogs. For these reasons pasture is found throughout the United States, except

in a small and extremely arid area in southwestern Arizona and southeastern California, where the limitation is due primarily to the inability to provide water for the stock, and not to the absence of vegetation.

PRESENT STAGE IN AGRICULTURAL CONQUEST OF THE CONTINENT

It appears that in the original condition—without irrigation or drainage—about 500,000,000 acres in the United States could have been used only for pasture; that about 500,000,000 acres more could have been used only for crops or for pasture; and that perhaps 75,000,000 acres might have been used for either pasture or forests. Owing primarily to topographic or soil conditions, about 250,000,000 acres were suitable only for forest. There is no land that is suitable for crops that is not also suitable for pasture. About 77,000,000 acres were unfitted for agricultural or forest use—desert lands not grazed, bare rock, swamps and tidal marshes, and sand dunes. Of the 1,903,000,000 acres of land in the United States only about 500,000,000 acres, therefore, possessed originally the physical conditions required in common by crops, pasture, and forest, and thus afforded to these three major means of production the possibility of potential competition for the use of the land.

By irrigation and drainage, man meanwhile has increased this area about 50,000,000 acres, or 10 percent. But this gain has been counterbalanced by about 50,000,000 acres of formerly cultivated land rendered essentially incapable of cultivation by erosion. Moreover, cities and parks, roads and railroads, golf courses, and cemeteries have expanded, until fully 50,000,000 acres have been taken from the agricultural and forest area.

TABLE 1.—*Use of land in original natural vegetation zones; based on tabulation of 1930 census statistics, by counties*

[Figures necessarily approximate]

Land class	Total	Original vegetation			
		Forest		Grassland	Desert
		East	West		
	1,000 acres	*1,000 acres*	*1,000 acres*	*1,000 acres*	*1,000 acres*
Land area, 1930	1,903,217	683,329	[3] 60,159	[3] 761,181	398,548
Land in farms, 1930	986,771	376,322	12,387	529,361	68,701
Agricultural land, 1929 [1]	836,825	266,820	7,604	496,089	66,312
Total crop land, 1929	413,236	169,319	2,754	231,943	9,220
Crop land harvested, 1929	359,242	143,660	2,267	205,906	7,409
Plowable pasture, in farms, 1929	109,160	43,559	1,048	62,877	1,676
Other pasture, in farms, 1929 [2]	269,673	29,485	3,128	184,080	52,980

[1] Land in farms less woodland in farms.
[2] Excluding woodland pasture.
[3] Owing to tabulation by counties, in many of which the farms are in the grassland valleys while the mountains are covered with forests, this figure for total forest land is 75,000,000 acres too low, and for grassland correspondingly high.

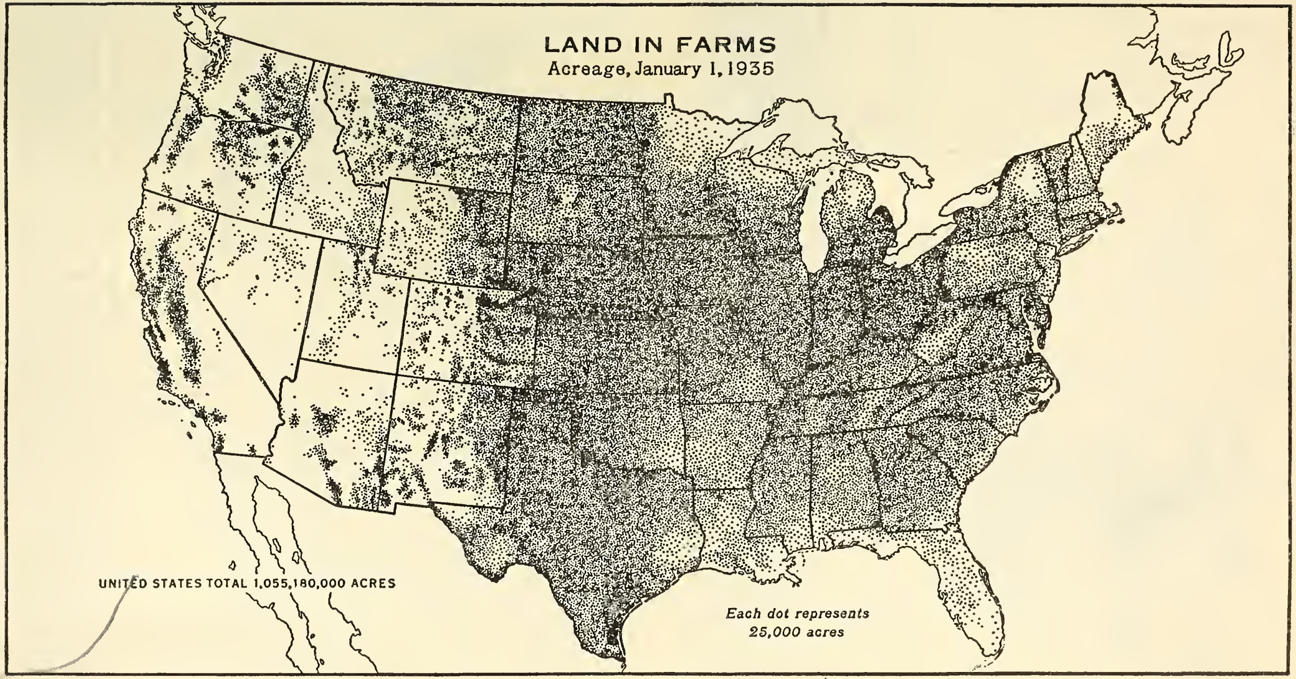


FIGURE 20.—Three-quarters of our farm land is in the Mississippi Valley. Or, considering the distribution with reference to rainfall, three-fourths is humid and subhumid farm land in the East (as defined in fig. 1), and one-fourth is mostly arid or irrigated or dry-farming land in the West. In the East the land not in farms, and not in cities, roads, or railroads, is hilly, stony, sandy, swampy, or infertile, and nearly all is in forest or has been recently cut over (fig. 50). But in the West only one-fifth of the land not in farms is in forest, and one-ninth in woodland and chaparral, while one-sixteenth is absolute desert. The remainder is open range, more or less covered with grasses and shrubby plants and used for grazing cattle or sheep.

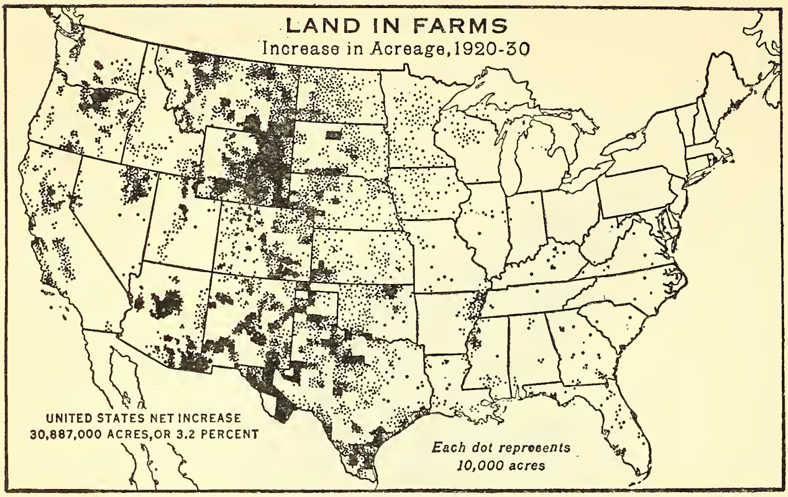


FIGURE 21.—The increase in farm land between 1920 and 1930 in the semiarid and arid portions of the Great Plains was the result in part of homestead filings by ex-soldiers who needed to live on the claim for only 7 months to establish ownership. Many of these "homesteads" were later sold to cattle or sheep men, and, being now privately owned, were included as parts of their ranches. In the Pacific Coast States and in the eastern half of the United States, the increase in farm land is attributable in places to drainage (the Mississippi bottoms), in places to clearing (northern Wisconsin and Minnesota), and in places, probably, to changes in interpretation of the definition of a farm by the census enumerators.

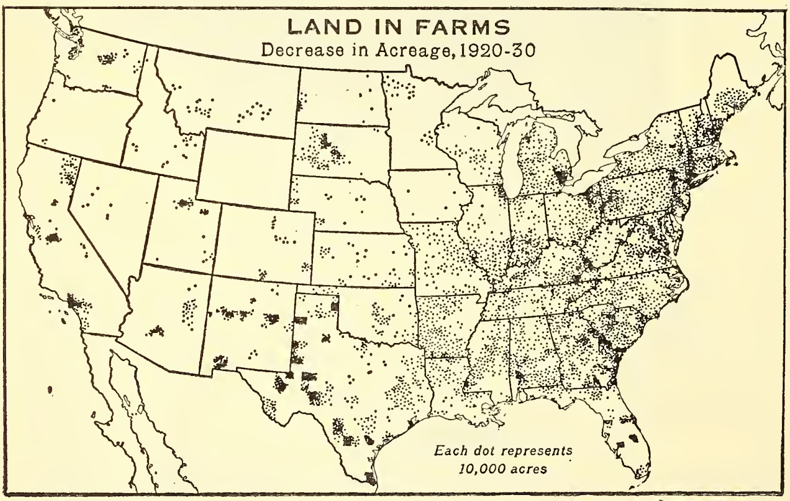


FIGURE 22.—The decrease in farm land between 1920 and 1930 took place mostly in the eastern, originally forested, portion of the United States. Every State east of the Mississippi River reported a decrease, also Missouri, Arkansas, and Louisiana. Forest soils are generally less fertile than grassland soils, and a larger proportion are hilly and less well adapted to large-scale machinery. Consequently the trend in farm acreage in the Northeastern and Southeastern States was downward for several decades prior to the depression. The decreases in several southwestern counties are attributable mostly to the extent of grazing land reported as within farm boundaries. In southern California, however, the decrease was due primarily to subdivision of farm lands near cities for prospective residential uses.

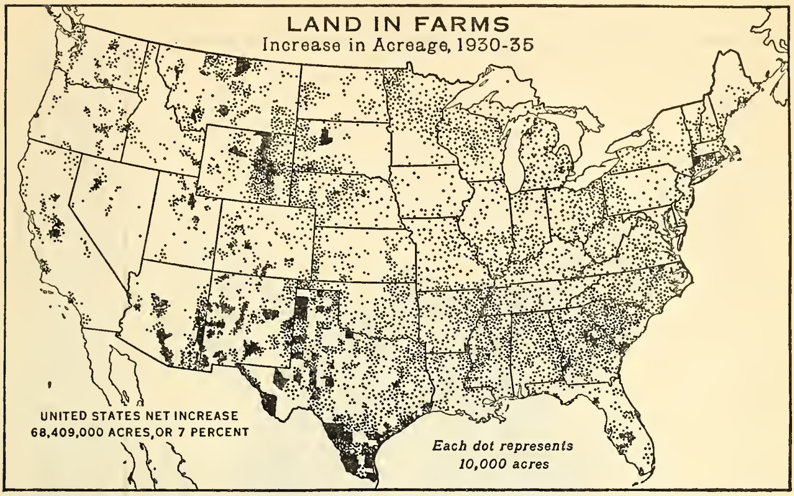


FIGURE 23.—During the depression years the increase in farm acreage was widespread. In most of the South this increase was relatively greater than in agricultural land (fig. 24), and much greater than that of crop land (fig. 32), which was affected by the Agricultural Adjustment Administration program and other factors. In many counties, apparently, more woodland was included in farms in 1935 than in 1930. In the Lakes States and Connecticut the increase in farm land, in agricultural land, and in crop land, were all notable, and are attributable in large part to the back-to-the-land movement of the unemployed, and in Connecticut to a more complete census in 1935. Decreases in farm land from 1930 to 1935 were so insignificant that the map is omitted.

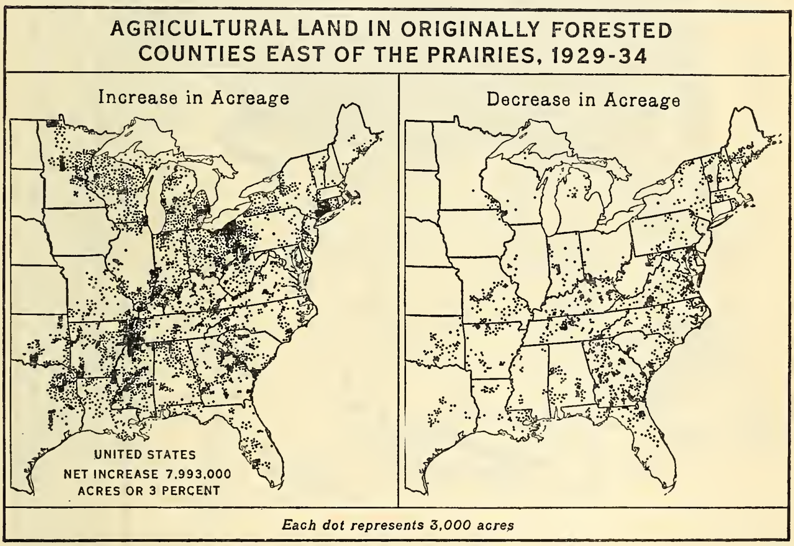


FIGURE 24.—Agricultural land (land in farms excluding woodland), increased in the originally forested counties east of the prairies and plains by nearly 8,000,000 acres net between 1929 and 1934. The increase in the counties reporting an increase exceeded 12,000,000 acres. Most of this land must have been cleared of forest or brush. Apparently the depression brought back pioneer labors to many farmers, and perhaps to more would-be farmers. In the Great Lakes States, the increase in agricultural land exceeded 2,000,000 acres, in the Southern States 2,800,000 acres. In Ohio it was 958,000 acres. In northern New England, however, the forest apparently continued to encroach on the agricultural land in many counties.

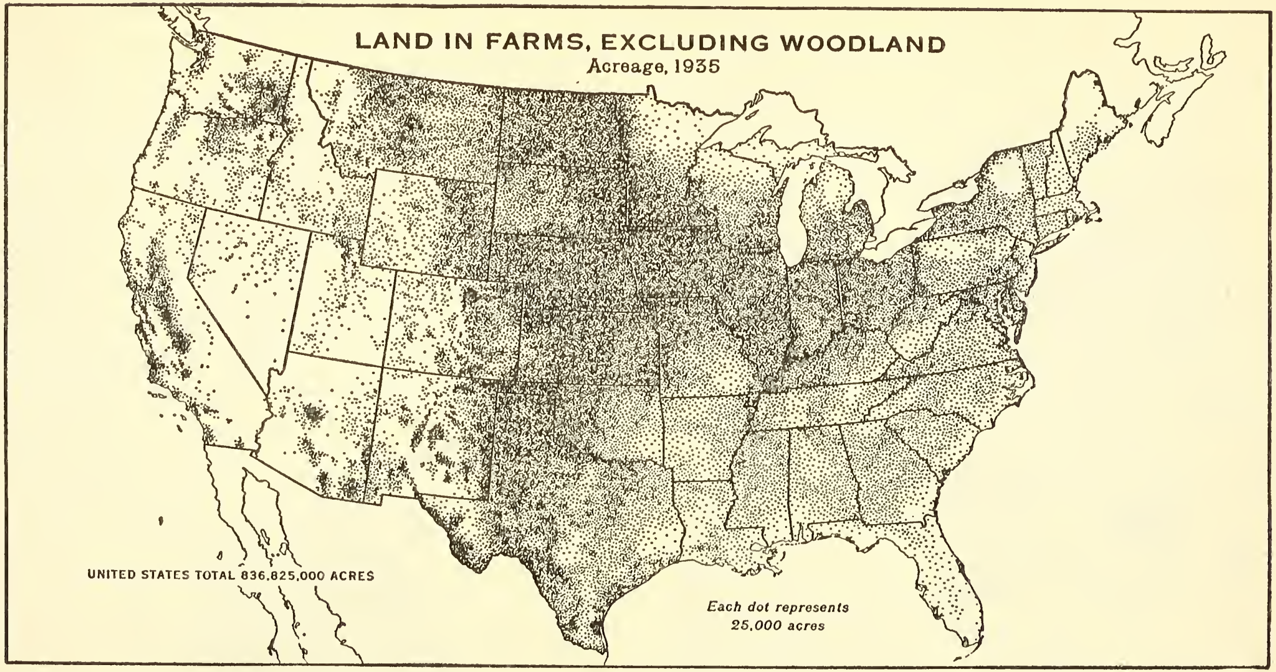


FIGURE 25.—Three-fourths of the agricultural land (farm land excluding woodland) in the United States is located in a level to rolling triangular-shaped region bounded on the north by the shallow, gravelly or stony soils that characterize the Laurentian Plateau in the northern portions of the Great Lakes States bounded on the east and south by the hilly and stony lands of the Appalachian, Ozark, and Ouachita mountain areas and bounded on the west by the Rocky, Mountains, beyond which lies the desert. Outlying areas of productive land are the valleys of the Appalachian region, portions of the Piedmont and Coastal Plain of the Southeast and South, the irrigated valleys of the Arid Interior region, the valleys of the Pacific coast, and the Columbia Plateau of eastern Washington and Oregon and northern Idaho.

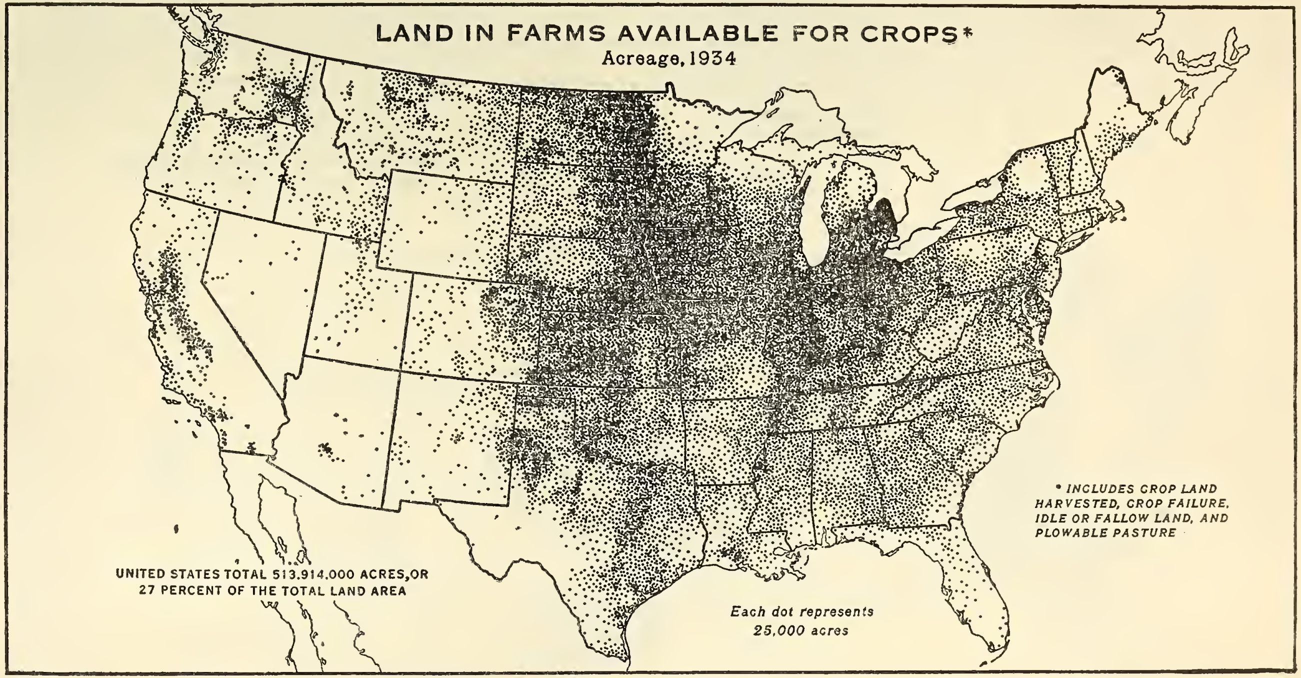


FIGURE 26.—The arable land (including plowable pasture) is most concentrated in the Corn Belt, the Dairy Belt, mostly in the southern portions, and the two wheat regions (fig. 1). About 300,000,000 acres, out of the 514,000,000 acres in the United States, are located in these four regions. Smaller areas having most of the land available for crops will be noted in southern Illinois and southward along the Mississippi River, in the black prairies of Texas, in the valleys of California, and in eastern Washington. In the nine eastern agricultural regions (fig. 1) taken as a whole, over 40 percent of the total land area is available for crops, whereas in the four western regions the average is less than 9 percent.

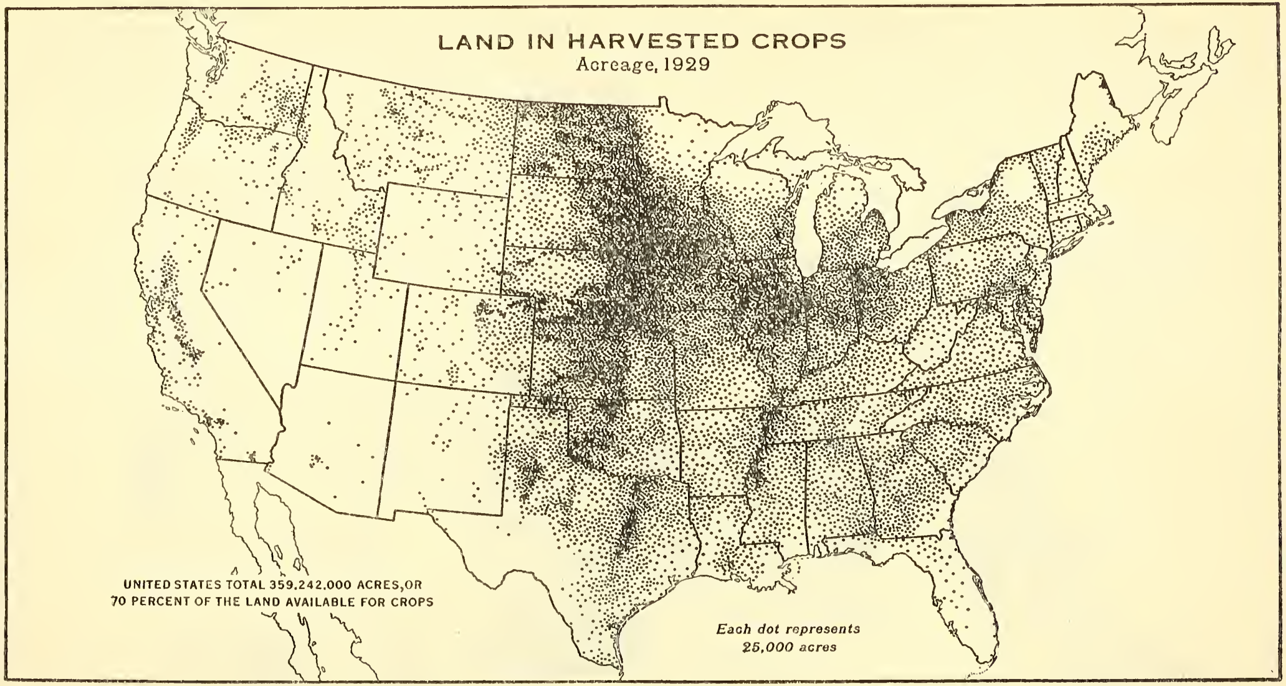


FIGURE 27.—Nine-tenths of the crop land is in the humid and subhumid eastern three-fifths of the United States, and nearly two-thirds is concentrated in a triangular-shaped territory the points of which are located in western Pennsylvania, southern Texas, and near the northwestern corner of North Dakota. In this territory, which includes only about one-fourth of the land of the United States, are produced four-fifths of the corn, three-fourths of the wheat and oats, and three-fifths of the hay crop of the Nation. No territory in the world of equal size affords so favorable natural conditions for the growth of corn, and few possess so favorable conditions for the culture of the small-grain and hay crops.

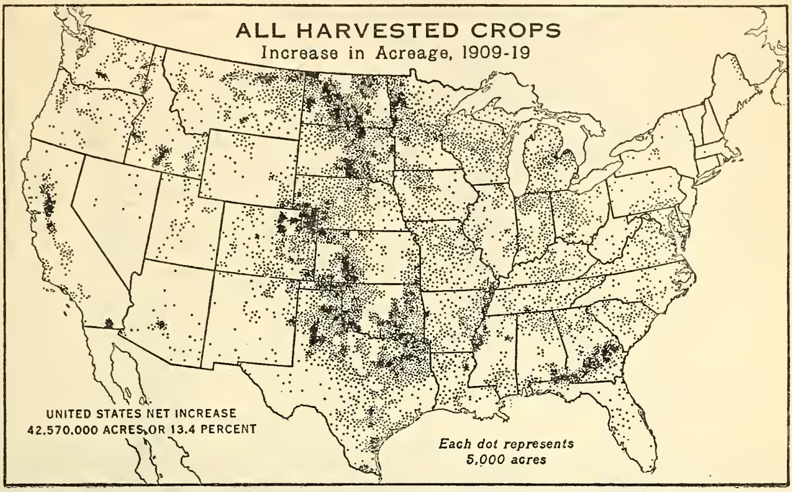


FIGURE 28.—The decade 1909–19 included the World War years when high prices for farm products led to the plowing up of about 40,000,000 acres of pasture land for crops, and in Georgia, eastern Texas and Oklahoma, the Lakes States, and elsewhere to the clearing of forest land also. In the Eastern States the pasture was partly rotation pasture, partly permanent pasture; but in the Great Plains region, where three-fourths of the increase in crop acreage harvested occurred, it was the native sod. Warring Europe wanted wheat, and the semiarid grassland of the Great Plains grew it in vast quantities during several favorable seasons. The year 1919 was dry in the northern plains and only about half the seeded acreage was harvested.

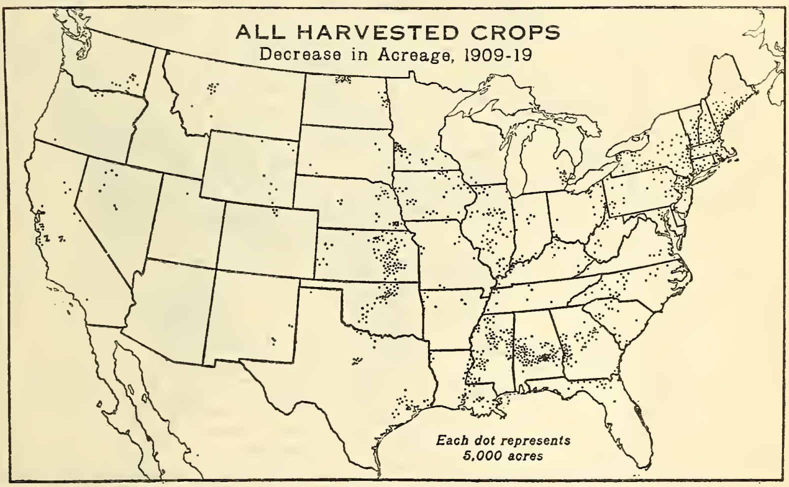


FIGURE 29.—The decrease in crop acreage harvested between 1909 and 1919 was almost confined to the New England States, eastern New York, and northern New Jersey, where crop land had been reverting to pasture and to forest for a third of a century or longer, to the Black Prairie of Alabama and Mississippi, where continuous cropping to cotton and corn had reduced the fertility of the soil, and to a belt of counties extending across Oklahoma and Kansas. In these latter counties and in scattered counties elsewhere the causes of the decline in crop acreage are not clear.

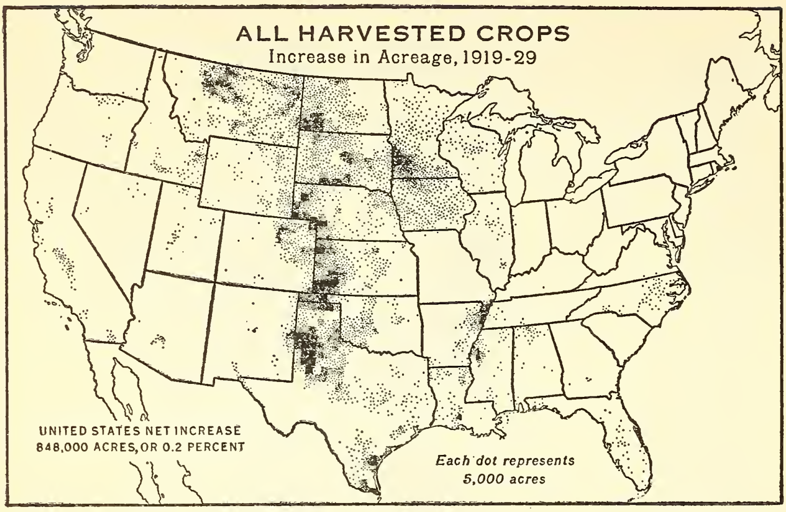


FIGURE 30.—The increase in harvested crop acreage between 1919 and 1929 occurred mostly in the semiarid portion of the Great Plains region, where the tractor, combine, and other labor-saving machinery made it possible to grow grain on the level land profitably at the prices then existing. Much of the increase in Texas is attributable to the extension of cotton production on to the Staked Plains. A notable increase occurred also in southwestern Minnesota and in the Mississippi River bottoms of Mississippi and northeastern Arkansas. In both these areas much land had been drained, but in Minnesota most of the apparent gain was due to a severe drought in 1919. The increase in the 1,130 counties in the United States reporting an increase during the decade exceeded 30,000,000 acres.

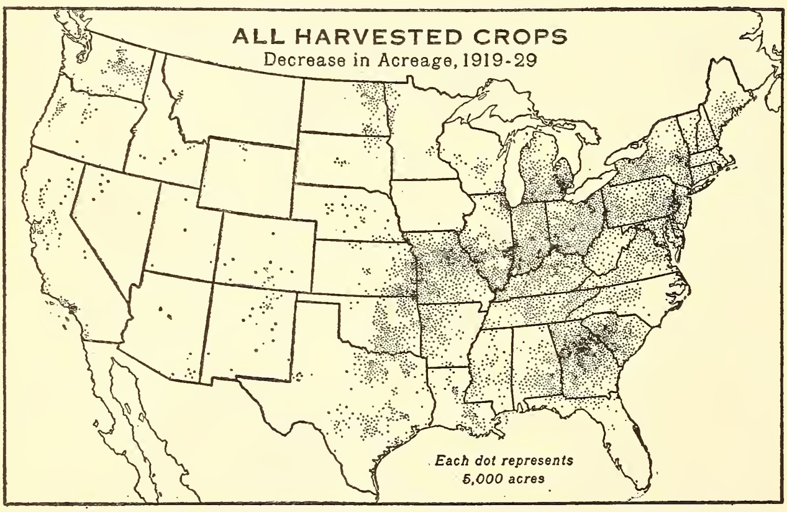


FIGURE 31.—A decrease in acreage of crops occurred between 1919 and 1929 in most of the originally forested portion of the United States. The decrease in the 1,940 counties reporting a decrease exceeded 30,000,000 acres. The outstanding decrease was in the Piedmont of Georgia and South Carolina and in a belt extending from southern New England across New York, southern Michigan, Ohio, southern Indiana, southern Illinois, and most of Kentucky and Missouri to eastern Oklahoma and central Texas. Part of this land was used for pasture, part lay idle, and part was growing up to brush. The farms in these areas generally are small, and the soils are poor or fair, but some are good. Erosion was doubtless a large factor in the decline in crop acreage in the Piedmont, Ohio Valley, and Missouri areas.

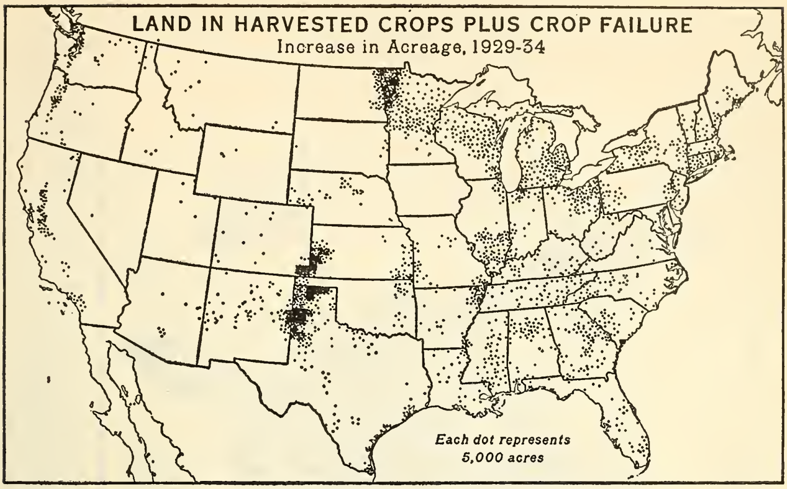


FIGURE 32.—The change in acreage of crops harvested plus failure (crops planted and perennial crops harvested) was extraordinary between 1929 and 1934. The increase in the "dust bowl" of the Texas Panhandle and southwestern Kansas was in crop failure rather than crops harvested, for this was the center of the drought area. But the increase in the Dairy Belt from northwestern Minnesota to New England was real and apparently reflects an attempt by the farmers in this region to produce more of the feed they require. In southern Illinois and in the Southern States the increase occurred more frequently on poor land than on good land, and, in general, in the areas of less commercial rather than more commercial agriculture.

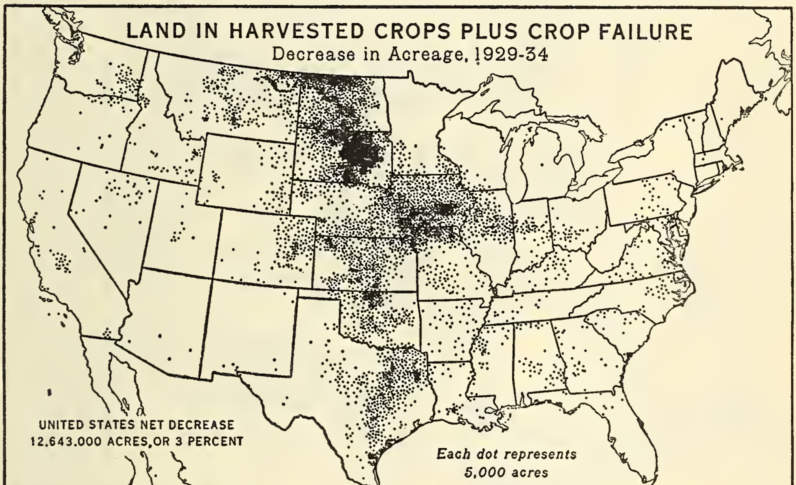


FIGURE 33.—The decreases in crop acreage, including crop failure, between the census years 1929 and 1934 were severe in the drought region. But only in the Dakotas and Montana and in eastern Texas had the drought been severe the preceding season, so some of this decrease is undoubtedly assignable to the crop-reduction program of the Agricultural Adjustment Administration. Whatever the cause, it is evident that in 1934 the decrease in crop acreage in the commercial grain-producing areas was extraordinary. In the counties reporting a decrease in the United States the total decline, as compared with 1929, was 24,606,000 acres.

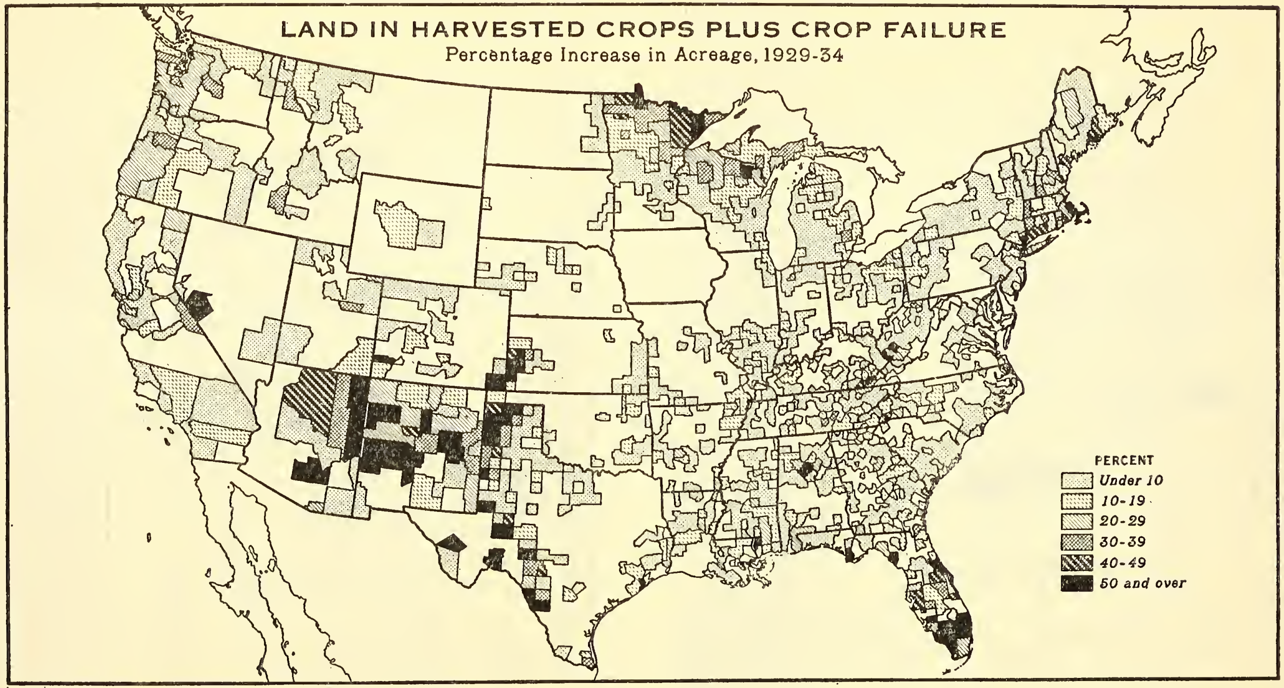


FIGURE 34.—During the economic depression many of the unemployed in the industrial areas sought shelter and sustenance with relatives or friends in the country or on abandoned farms in the Northeast and Great Lakes region and in the southern Appalachians. In addition, many rural youth were backed up on farms in these regions and elsewhere. Many new houses were built, fields were rented, farms were subdivided, and some forest land was cleared. In several counties in the southern Appalachians and in the northern Great Lakes region, the increase in crop land exceeded 50 percent. In these regions, however, the total crop acreage is small. In the Texas Panhandle and New Mexico a notable increase in farms and in crop land also occurred.

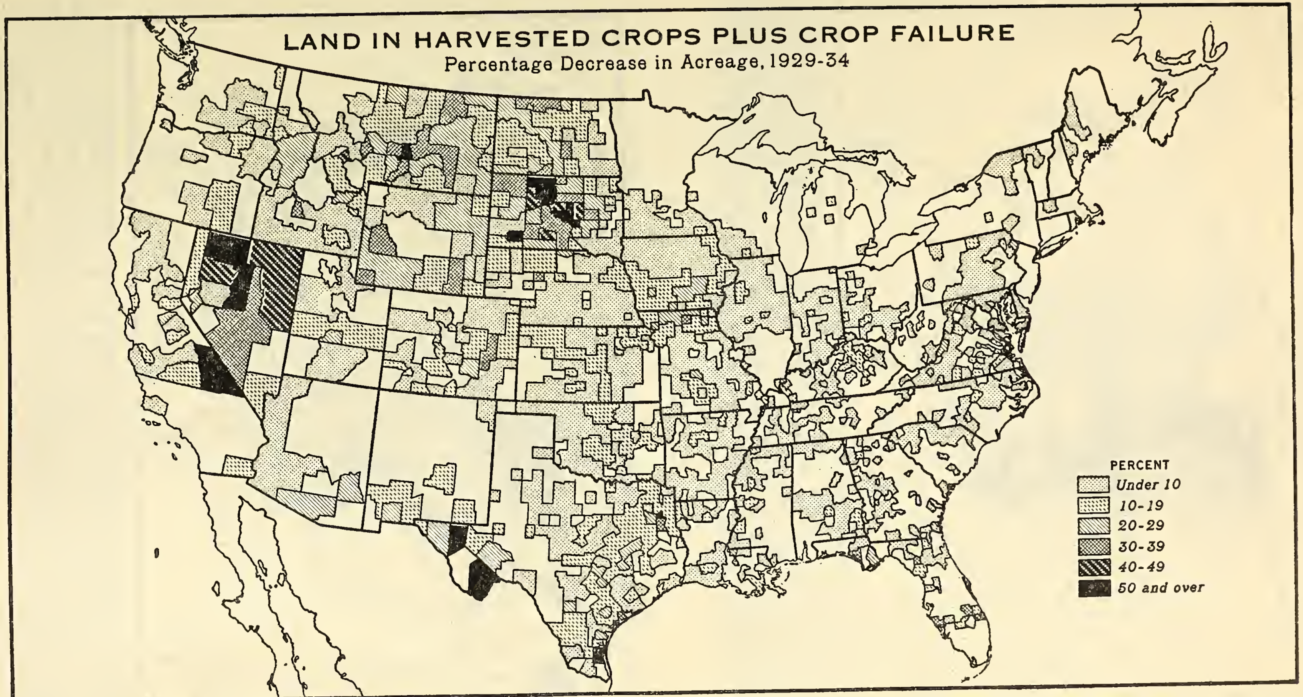


FIGURE 35.—During the economic depression the Federal Government made great efforts to reduce the acreage of cotton, wheat, and particularly corn. The drought of 1934 supplemented these efforts. In the Spring-Wheat Belt, where the season of 1933 had been very dry also, the crop acreage planted in 1934 varied from 10 to 50 percent less than in 1929. In the Corn Belt the decrease was less than 20 percent in nearly all counties, and in most counties less than 10 percent. This was true also of the Hard Winter-Wheat Belt and of central and eastern Texas. In the South, east of the Mississippi River, increases in crop acreage were as frequent as decreases, except in Virginia, where most counties reported a decrease.

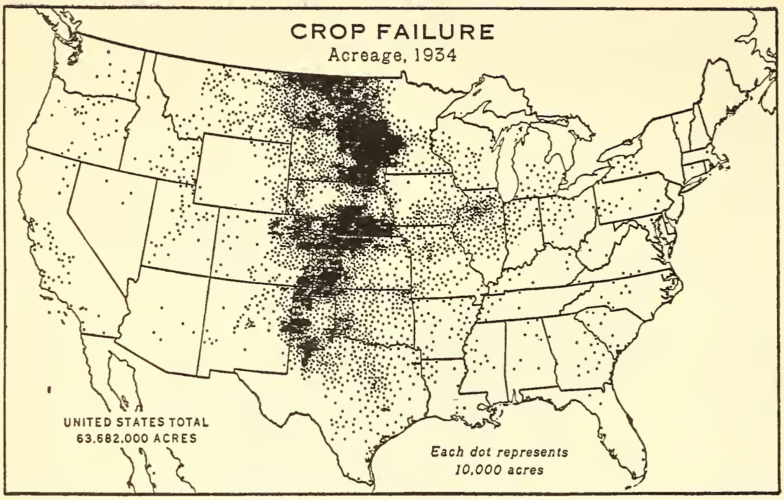


FIGURE 36.—The season of 1934 was characterized by drought of unprecedented duration, extending over most of the country between the Rockies and the Appalachians north of the Cotton Belt. This drought was especially severe in the Great Plains region. In the northern Plains it had been preceded by several dry seasons, which helps to explain the magnitude of the crop failure in the Dakotas. This drought must be kept in mind in comparing all maps showing change in acreage between 1929 and 1934. In 1924 there were 13,218,000 acres of crop failure in the United States reported by the census. in 1929 about 12,707,-000 acres, and in 1934, 63,682,000 acres.

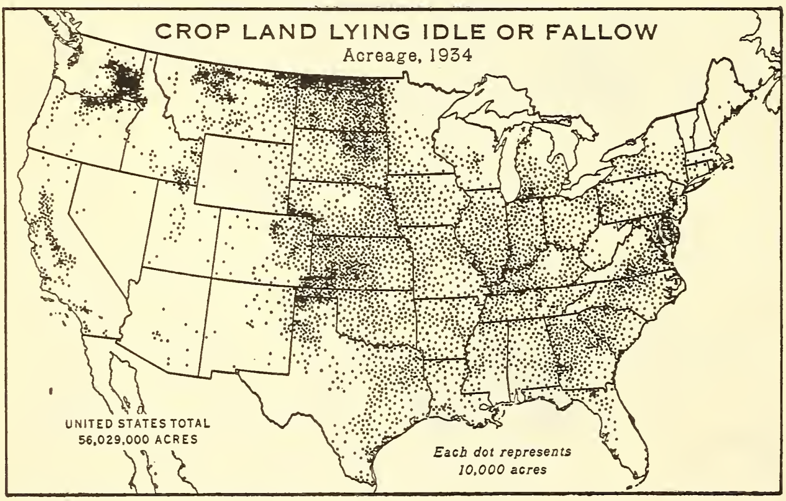


FIGURE 37.—The greatest extent in the eastern humid half of the United States of crop (plow) land lying idle in 1934 was in the Piedmont, extending from New York City to Alabama, and in the lower Ohio River area, including western Kentucky and southern Indiana and Illinois. The soils in both these areas are mostly of medium or low fertility, and many fields are severely eroded. Less concentrated, but scarcely less important, were the millions of acres lying idle in the central and western Cotton Belt, and in New York, Pennsylvania, and southern Michigan. The large acreage in the Dakotas and Montana is partly summer fallow, and partly attributable to drought, and the dense area in eastern Washington is mostly summer fallow.

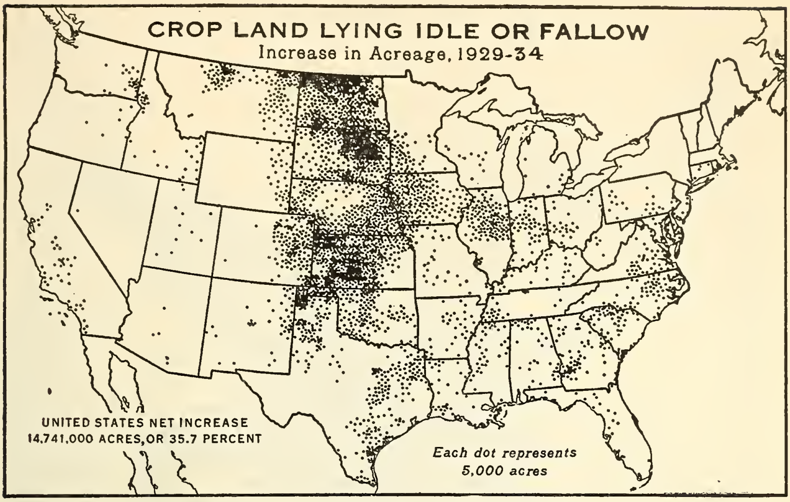


FIGURE 38.—The outstanding increase between the census years 1929 and 1934 in crop land lying idle was in the Spring-Wheat and Hard Winter-Wheat Belts. A considerable part of this increase probably was caused by drought; in the Spring-Wheat Belt to drought the preceding season as well. Most of the increase in Illinois and Iowa, on the other hand, may be attributed, probably, to the Agricultural Adjustment Administration program. Practically no increase in idle land occurred in the Dairy Belt (figs. 32 and 34), but there were many local increases in the Cotton Belt, and a few in the Far West.

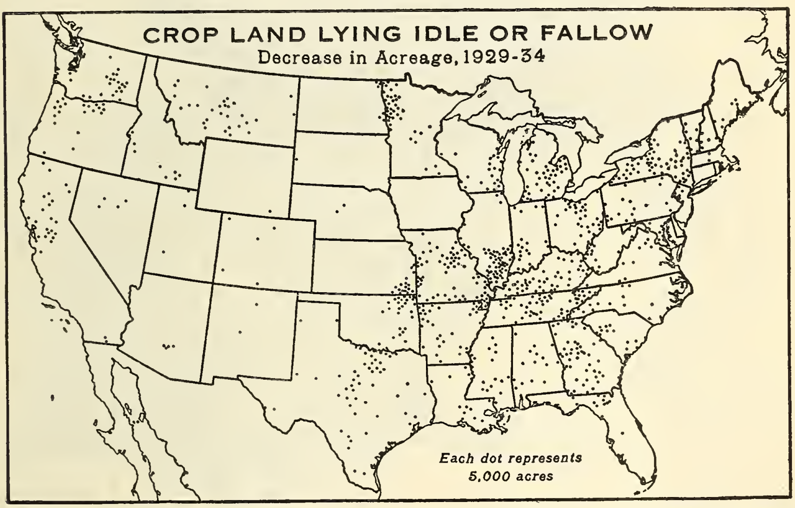


FIGURE 39.—Decreases in idle crop land occurred in the Cotton Belt as well as increases, but were less numerous. In the Corn and Winter Wheat Belt, notably in southern Illinois and southeastern Kansas, the increase in crop acreage accompanied a decrease in idle crop land. This was true also in many counties in the Dairy Belt. In these generally less fertile regions, characterized by smaller farms and somewhat less commercial agriculture than that in the Corn Belt, the program of the Agricultural Adjustment Administration apparently resulted in little if any increase in idle crop land. Even in the Corn and Cotton Belts the increase was not large. It was primarily drought in the Great Plains region that caused the national increase.

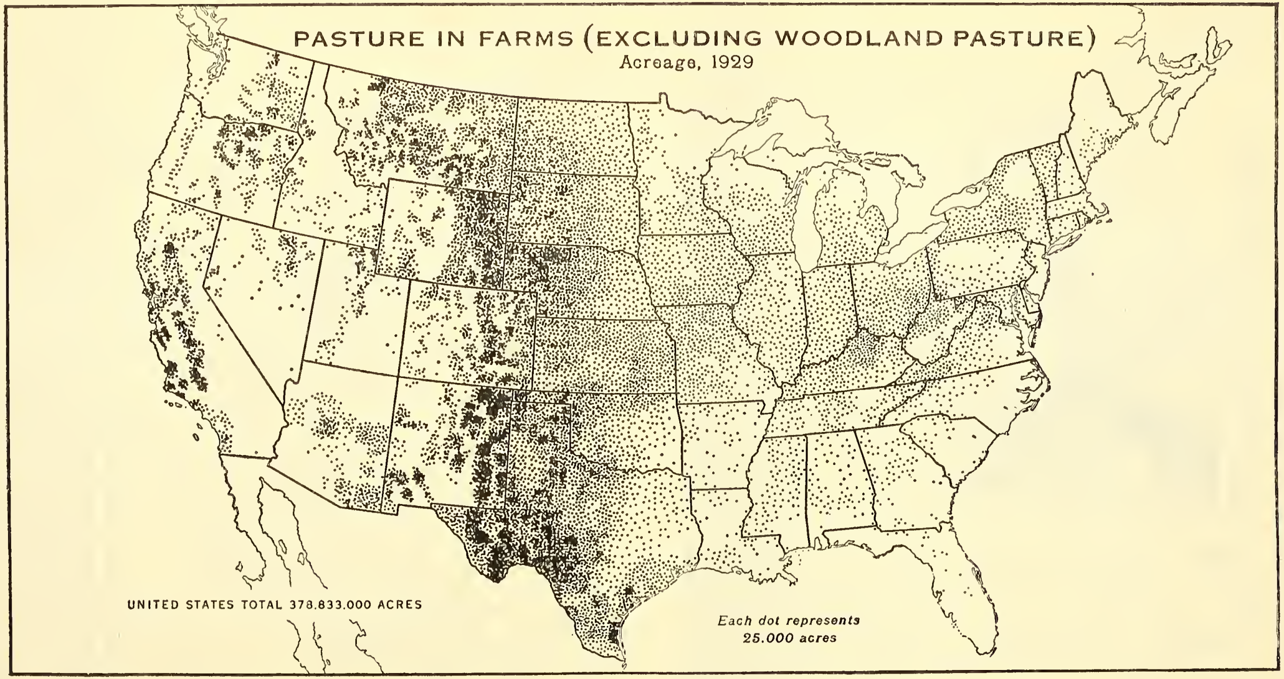


FIGURE 40.—The Great Plains region, extending from Montana and the Dakotas to the Edwards Plateau of Texas, includes more than half the pasture land in farms in the United States. Much pasture in the Great Plains, however, is of low carrying capacity because of low rainfall. In eastern Kansas the Flint Hills district, famous for its pastures, can be recognized on the map. There is a large acreage of pasture in the Corn Belt, especially in eastern and southern Iowa and northern Missouri. In the East the densest acreage is in the Bluegrass district of Kentucky, a livestock area, and the upper Ohio Valley, in the valley of Virginia, another livestock area, in New York, and in Vermont. West of the Rocky Mountains the farm pastures are found mostly in the valleys of California and in eastern Oregon and Washington. There are great differences in the value of these pasture lands indicated on the map.

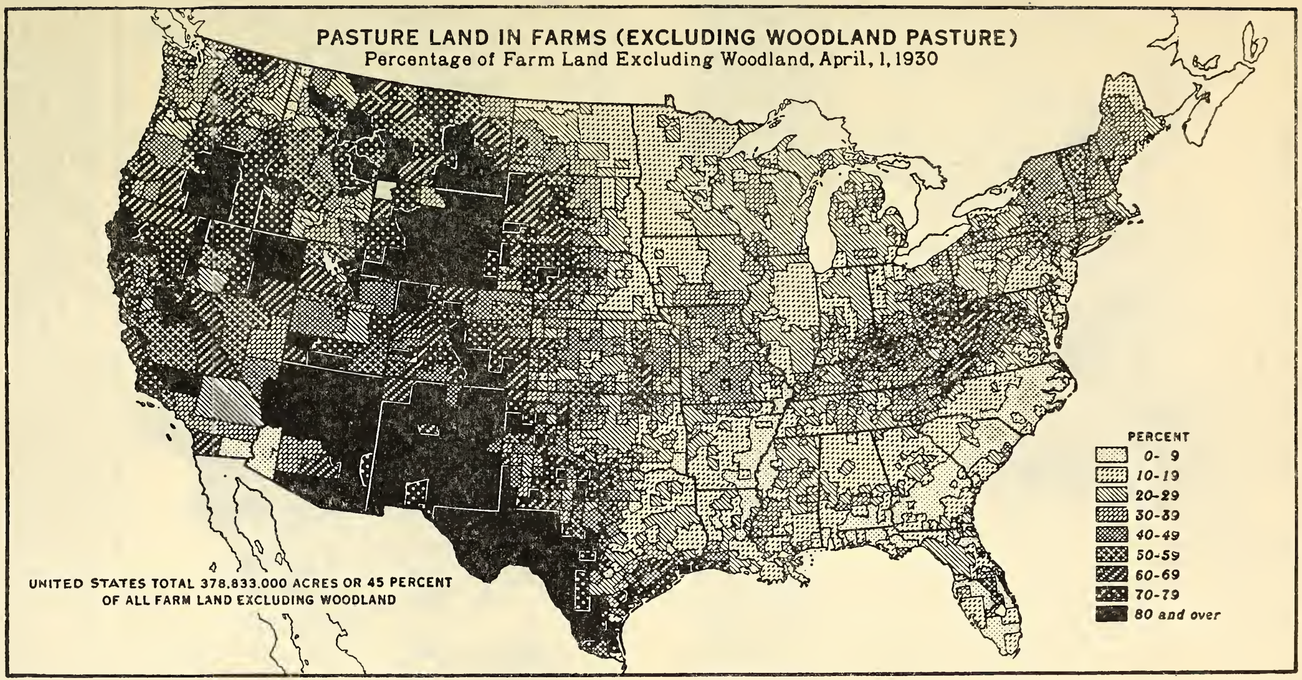


FIGURE 41.—Pasture constitutes over half of the agricultural land (woodland excluded) in northern Vermont, in several counties in New York, in the northern Piedmont of Virginia and in the limestone valleys of that State and of West Virginia, in the upper Ohio Valley and in the Bluegrass district of Kentucky, in the Gulf Coastal Prairie of Texas, and in the Flint Hills of Kansas. In practically all other sections in the humid eastern half of the Nation the acreage of crop land, including that lying idle, exceeds the acreage of pasture. But in the western half of the Nation the acreage of pasture, including that not in farms, greatly exceeds that of crops, particularly in the arid portions where crops cannot be grown except by irrigation. However, the carrying capacity of the pasture generally is low, and the sustenance supplied by crops, many million acres of which are irrigated, exceeds that supplied by pasture in the West as a whole.

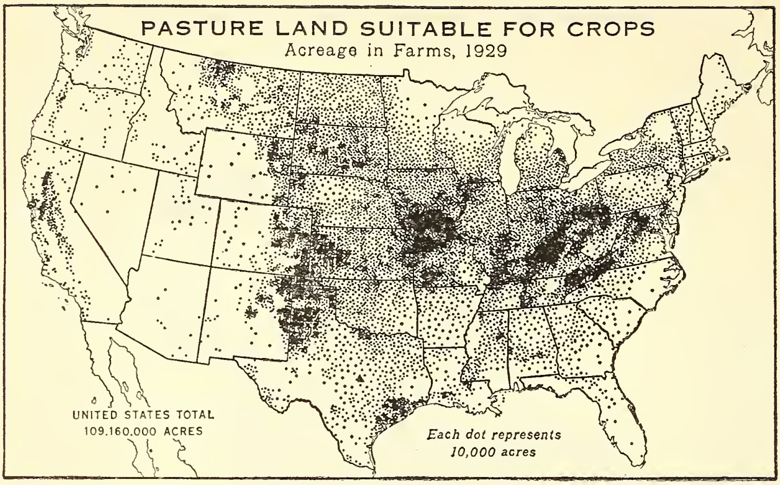


FIGURE 42.—Seven areas where plowable pasture is very important can be seen on the map: (1) The bluegrass basin of Kentucky, (2) the Valley of Virginia, and (3) the lower Shenandoah Valley, all areas of limestone soils often shallow (Hagerstown series), (4) the upper Ohio Valley, having soils partially derived from limestone, (5) the uplands in northern Missouri and southern Iowa, (6) the Gulf Coastal Prairies of Texas, and (7) the southern Great Plains (High Plains) extending from western Nebraska almost to the Edwards Plateau in Texas. This plains area, though much larger, is much lower in carrying capacity per acre because it is semiarid. The central portion includes the "dust bowl" of recent drought years, and the suitability of much of this pasture for crops might be questioned.

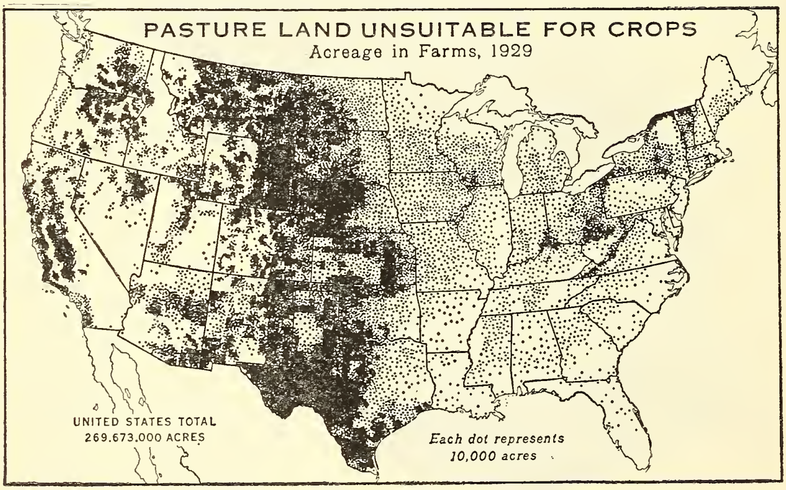


FIGURE 43.—Most of the pasture land in farms unsuitable for crops is located in the Great Plains region, where the climate is too dry, in many areas, or the land too rough for crops. There are large acreages also in the Pacific Coast States, Arizona and western New Mexico, in the upper Ohio Valley, in New York, and Vermont. A less dense distribution of such pasture is found in the Great Lakes States, Iowa, Missouri, and western Illinois. In the humid eastern half of the United States the unsuitability for crops is due generally to rough surface or stony soil. In addition to this pasture land in farms, there is much grazing land not in farms, principally in the western half of the United States. Most of this land is of low carrying capacity.

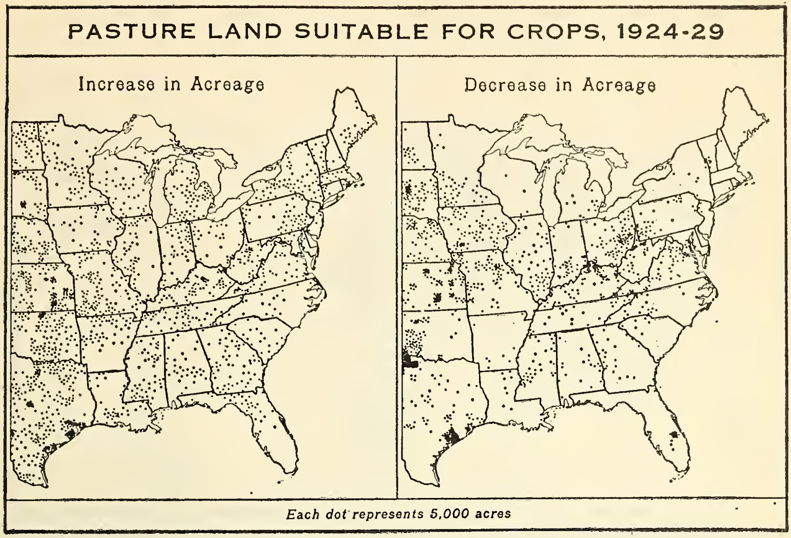


FIGURE 44.—Pasture land "which could be plowed and used for crops without clearing, draining or irrigating", to quote from the census question, increased between 1924 and 1929 in the Dairy Belt, as crop land decreased. It also increased in much of the South. The decreases occurred principally in the Ohio River Valley and in many counties in the western Corn Belt, in Kansas, and in Texas. The western portion of the United States is not shown because of changing weather conditions in the semiarid areas, which alter judgments as to whether pasture land is suitable for crop production.

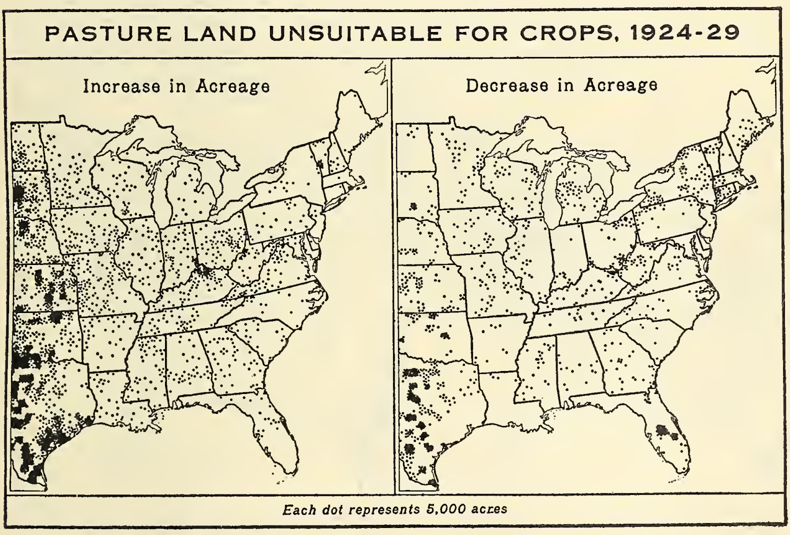


FIGURE 45.—Pasture land not suitable for crops, excluding woodland pasture—"all other land used for pasture", to quote the census inquiry—decreased in acreage in most of the Dairy Belt between 1924 and 1929. This decrease doubtless meant reversion to brush and forest. The increase in acreage in southeastern Ohio and northern Kentucky is similar to the decrease in pasture suitable for crops, and suggests that advancing erosion may have led to a change in classification. The increases indicated in the States from Texas to the Dakotas are also probably largely attributable to changes in classification associated with the prolonged drought preceding the census enumeration.

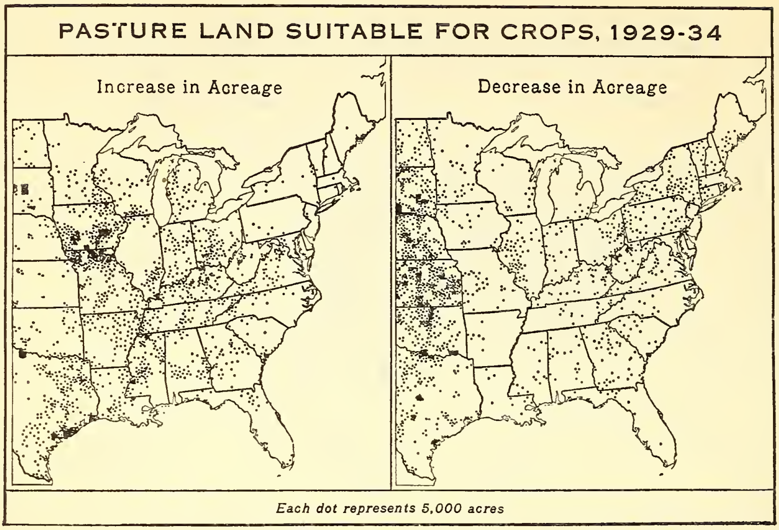


FIGURE 46.—Pasture land suitable for crops decreased in New England, New York, and Pennsylvania during the depression by about as much as it increased between 1924 and 1929. This decrease was associated with an increase in crop acreage. But in many counties of the Ohio Valley, the former decrease changed to an increase, and in Iowa and northern Missouri the increase was notable. This increase is probably attributable in large measure to the program of the Agricultural Adjustment Administration, to increasing severity of soil erosion, and to the drought. The decrease in acreage along the eastern margin of the Great Plains may be due partly to drought, or may be attributable to greater conservatism in classifying pasture land as suitable for crop production.

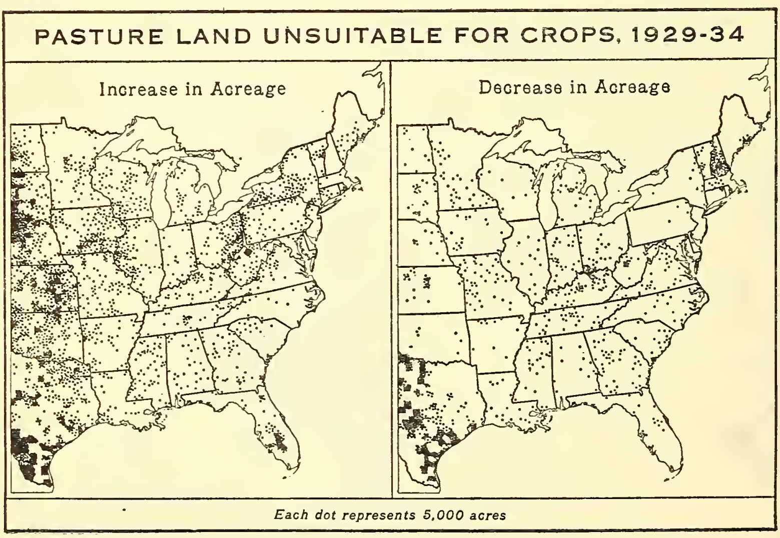


FIGURE 47.—The decrease in pasture land not suitable for crops in New Hampshire between 1929 and 1934 may be due to a change in the concept of suitability associated with the economic depression and the increase in part-time and subsistence farms. The decreases indicated in Texas may similarly be associated with a changing concept in the minds of the farmers or census enumerators. The increase in New York and eastern Ohio may represent the growing up of brush and small trees in old pastures, but in Iowa and Illinois probably represents increasing erosion and emphasis given to use of pasture. In the Great Plains the increase is again probably mostly a shift in judgment induced by the depression and the drought.

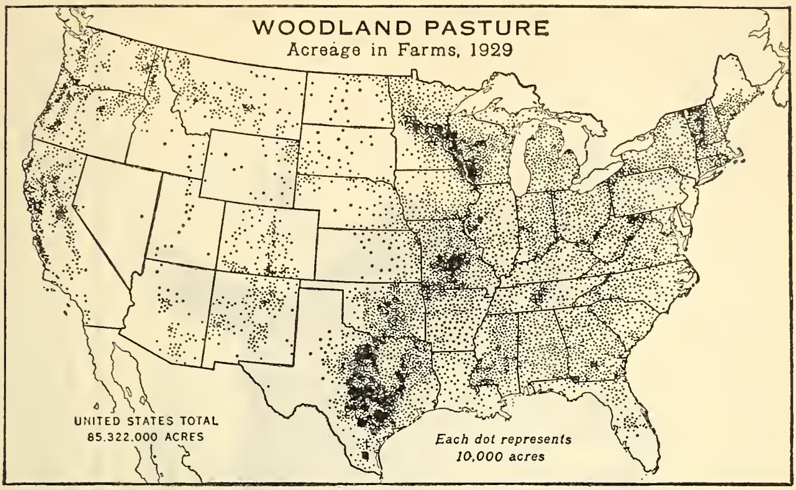


FIGURE 48.—More than half of the forest and woodland in farms is used also for pasture. Along the prairie margin in central Texas, Oklahoma, and Missouri, in Illinois, western Wisconsin, and central Minnesota, where the stand of trees is thin and there is much grass beneath, nearly all the woodland is used for pasture. In New England and parts of New York and Michigan, where the trees were creeping down onto the pastures, there was a large acreage of woodland pasture in 1929. In the South, especially in the open stands of longleaf pine, it is common practice to graze cattle and even hogs in the forests. This is true also of the live oak groves that fringe many of the valleys of California.

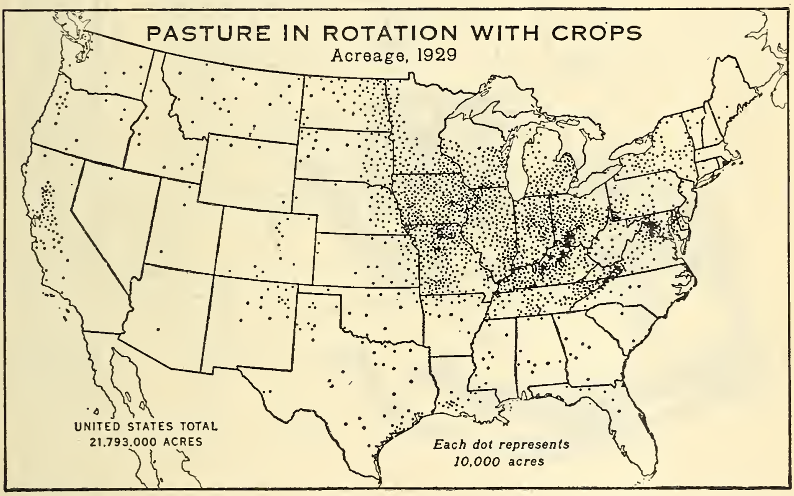


FIGURE 49.—The outer boundaries of the region in which rotation pasture is extensive correspond with those of timothy and clover hay, except that there is much of this hay in New England, New York, and Pennsylvania, and little rotation pasture. Rotation pasture is characteristic of the Corn and Winter-Wheat Belts and of the Corn Belt as far west as eastern Kansas and Nebraska, but as it consists largely of timothy and clover, extends north of the Corn Belt into Michigan, Wisconsin, Minnesota, and the Dakotas. Very little pasture is rotated with crops in the Cotton Belt.

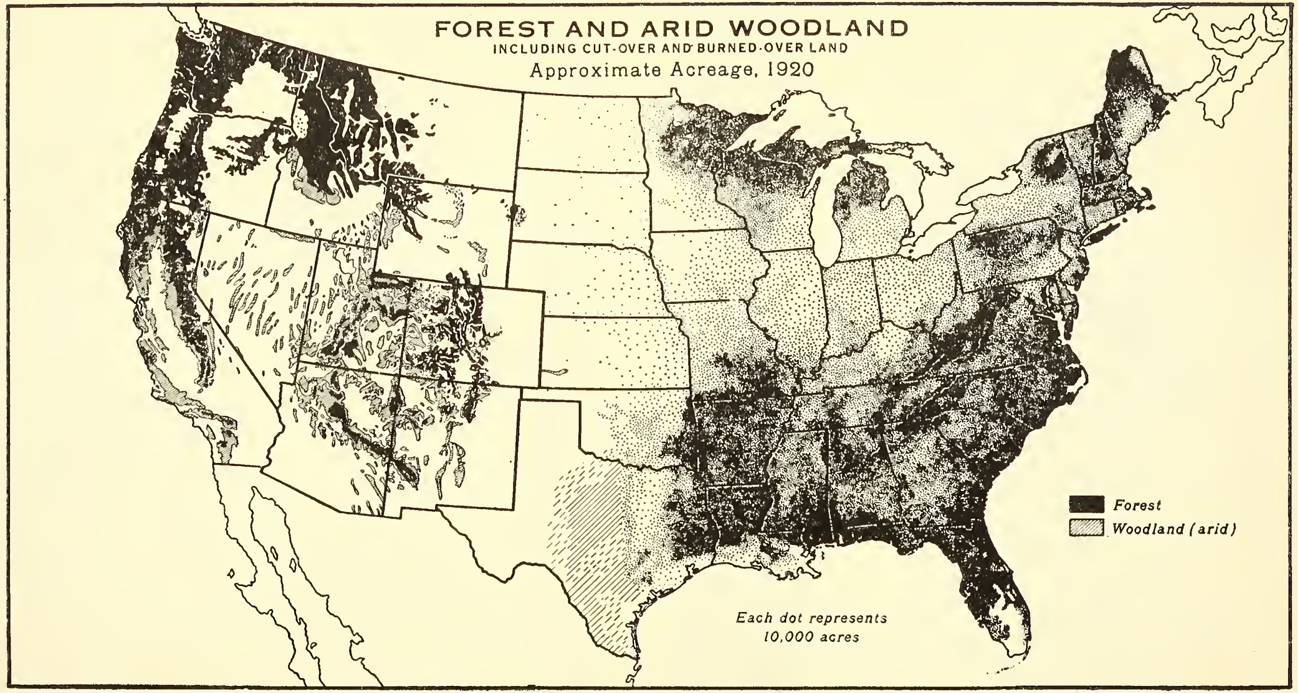


FIGURE 50.—This generalized map of forest, cut-over land, and woodland was prepared in cooperation with the Forest Service. The estimates for the States in the originally forested eastern portion of the United States, except for several States in which forest surveys have been made, are based largely on deductions from the statistics of the 1920 census. Of the 500,000,000 acres of forest and cut-over land in the United States, excluding 120,000,000 acres of arid woodland and other noncommercial forest, about one-half is in the South, nearly one-eighth in the Northeastern States, nearly another eighth in the Lakes States, and nearly one-quarter in the West, mostly in the Rocky Mountain and North Pacific regions. However, nearly half of the 190,000,000 acres of saw timber, and about 80 percent of the board feet, is in the West.

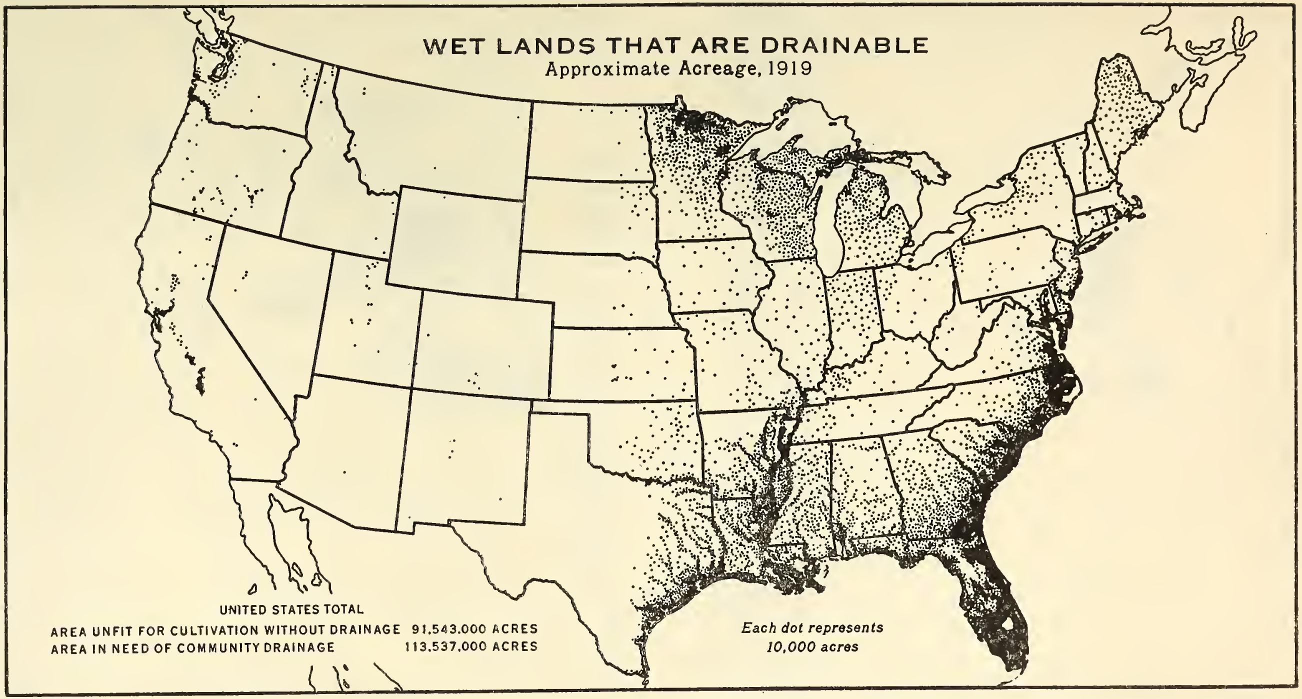


FIGURE 51.—Two-thirds of the land unfit for cultivation without drainage is in the Southern States, and one-half of the remainder is in the three Lakes States. Nearly all of the wet land in the South, except the Florida Everglades and prairies, tidal marsh, and Gulf coastal prairies, is forested, and requires both drainage and clearing; but much of the wet land in the Lakes States consist of unforested peat bogs. (Based largely upon drainage reports in Bureau of Agricultural Engineering, and upon soil-survey, topographic, and Land Office maps. Drawn by L. A. Jones, Bureau of Agricultural Engineering, and F. J. Marschner, Bureau of Agricultural Economics, after comparison of physical maps with statistics of drainage enterprises and of land in farms that need drainage, according to the 1920 census.)

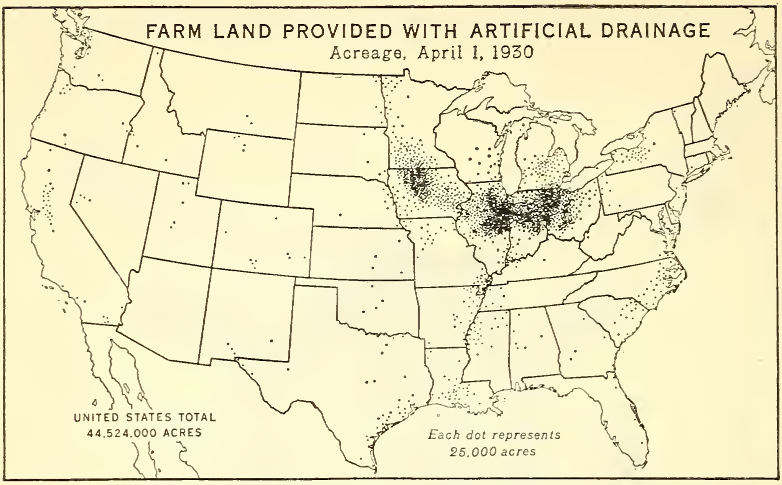


FIGURE 52.—Most of the farm land that has been drained is located in the portions of Ohio, Indiana, Illinois, Iowa, southern Minnesota and Michigan, and western New York, that were covered with the last, or Wisconsin glaciation. The glacial deposits obstructed many former streamcourses. Shallow lakes, marshes, and swamps resulted. The soils in this area after drainage, in general, are good to excellent. Other areas containing considerable drained land are the Mississippi River Delta, extending from Cairo, Ill., to Louisiana, the coastal prairies of Louisiana and Texas, the lower Coastal Plain in the Carolinas, and the valleys of California.

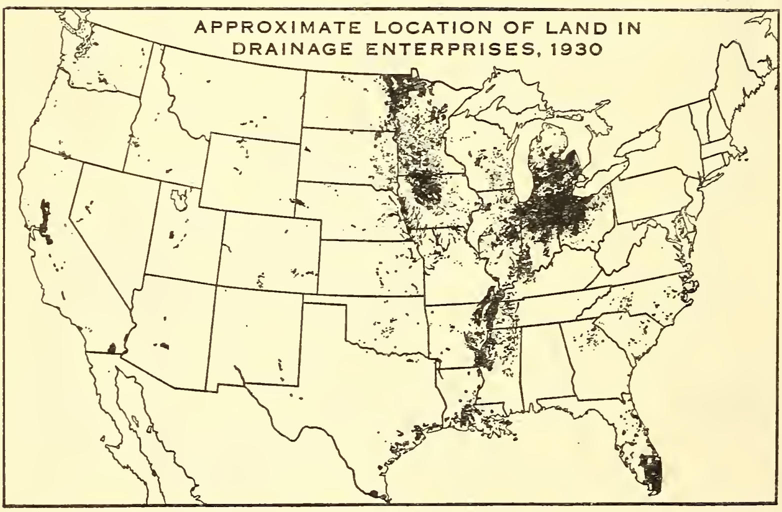


FIGURE 53.—Two-thirds of the land in drainage enterprises is located in the glaciated portions of northwestern Ohio, northern Indiana and Illinois, southern Michigan, and north-central Iowa and Minnesota. Most of the other third is in the bottom lands of the Mississippi River and its tributaries, in the Everglades of southern Florida, and in the irrigated districts of the West. Over 88,000,000 acres were reported in drainage enterprises in 1930, of which 66,200,000 were "fit to raise a normal crop", and 10,800,000 to raise a partial crop. But 31,600,000 had been fit to raise a normal crop prior to drainage and 19,100,000 acres fit to raise a partial crop. Improved land in drainage enterprises was reported as 63,514,000 acres in 1930 an increase of over 19,000,000 acres since 1920.

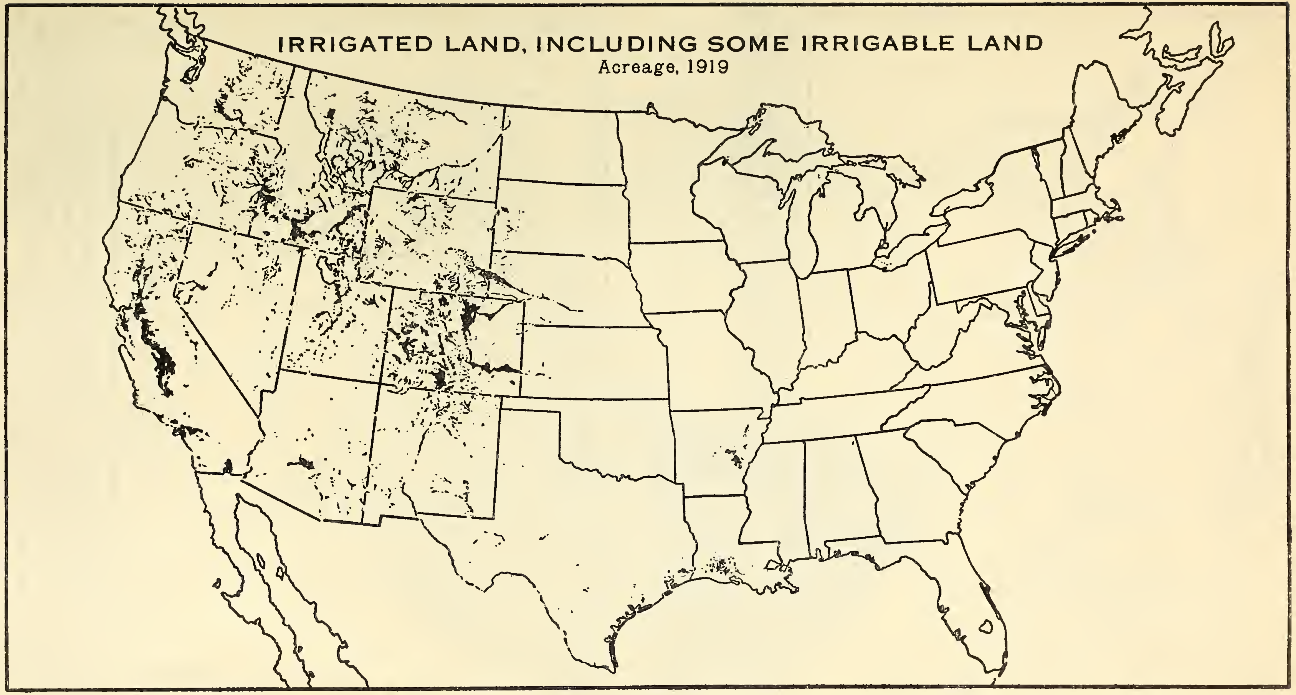


FIGURE 54.—The area of irrigated land increased 5,000,000 acres, or one-third, between 1909 and 1919; and the irrigation enterprises were capable of irrigating 7,000,000 acres more than were actually irrigated in 1919. There is sufficient water in the West to irrigate double the area the enterprises were capable of irrigating in 1920, or about 50,000,000 acres, when higher prices of farm products justify the constantly increasing cost per acre of construction of irrigation works. California, Colorado, and Idaho lead in irrigated acreage at present; but Montana rises into second place in the estimate of total irrigable area. Local changes, many transitory, have occurred since 1919 in the acreage and location of irrigated land, but the total area irrigated in 1919 was 19,191,716 acres, and in 1929, the latest year for which statistics are available, it was 19,547,544 acres.

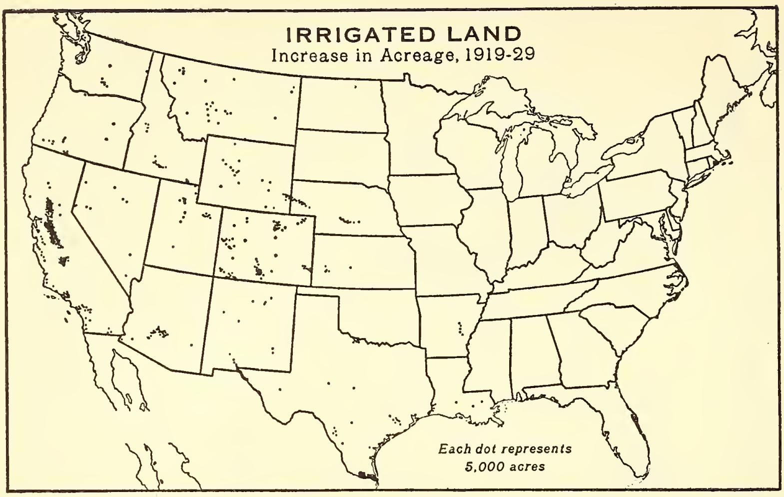


FIGURE 55.—One-third of the increase in acreage of irrigated land between 1919 and 1929 took place in California and nearly one-sixth in Colorado. Other areas that stand out on the map are the lower and upper Rio Grande Valley districts in Texas, the Salt River Valley in Arizona, and the North Platte districts in Nebraska and Wyoming. Smaller local increases occurred in all the Western States, also in the rice districts of Arkansas, Louisiana, and Texas.

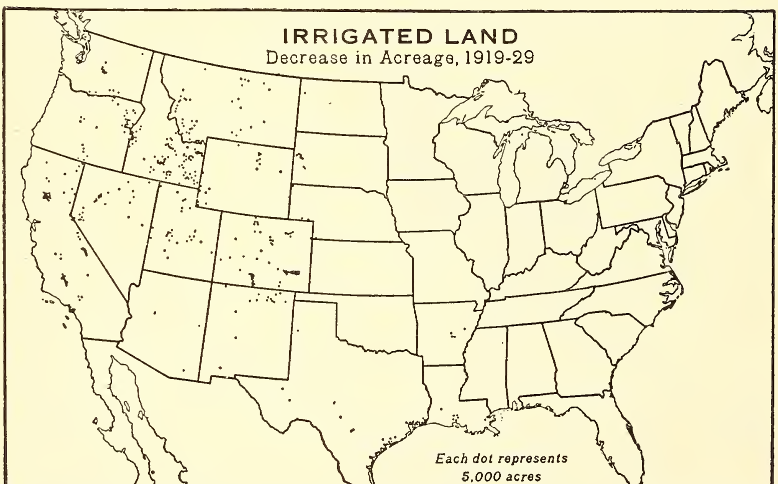


FIGURE 56.—One-third of the decrease in acreage of irrigated land between 1919 and 1929 occurred in Idaho and adjacent portions of Montana and Oregon. Notable local decreases occurred also in the Arkansas Valley, and the western portion of the San Luis Valley in Colorado, in a number of counties in Utah, Nevada, and California, and in Kittitas County, Wash. Decreases may be noted also in portions of the rice districts of Texas, Louisiana, and Arkansas. In the Nation as a whole decreases almost balanced increases.

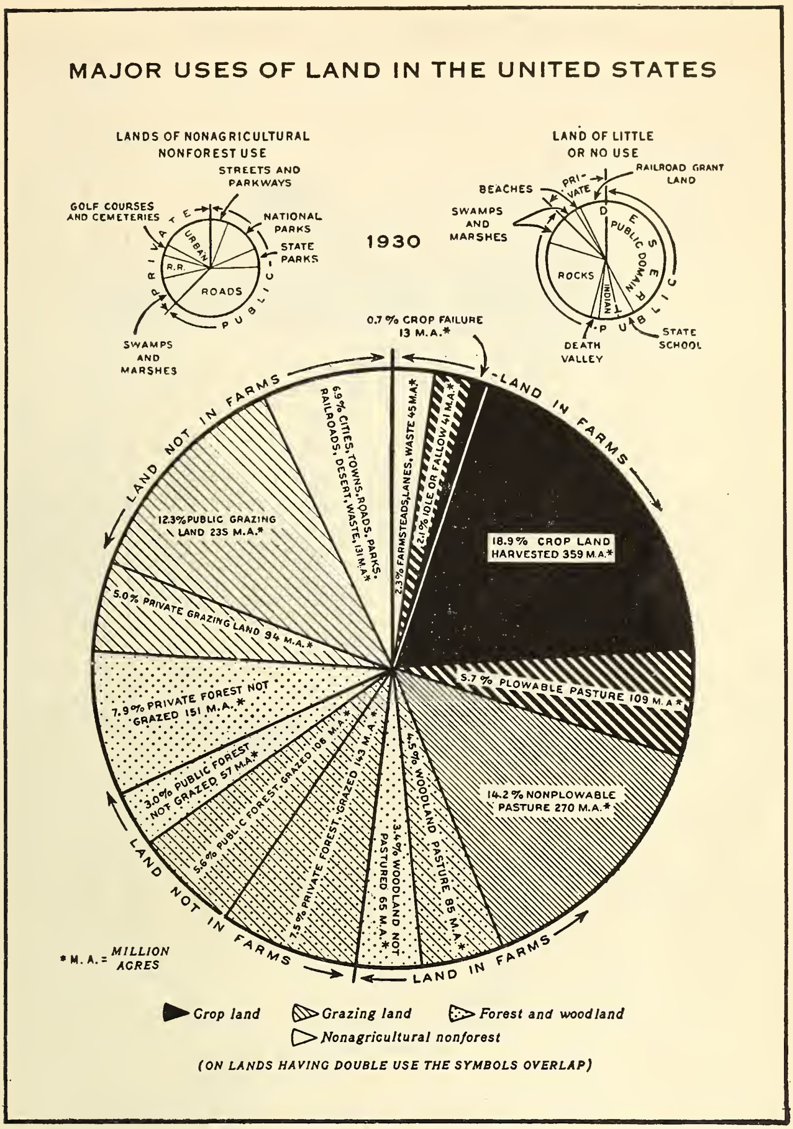


FIGURE 57.—A little over half of the land in the Nation is in farms. Of this land in farms, 38 percent was in crops in 1929 (including crop failure), 37 percent was in pasture (excluding woodland pasture), and 15 percent in woodland, the remainder being crop land lying idle, farmsteads, lanes, and waste land. All crop land is in farms, but the acreage of pasture, including range land, outside of farms exceeds that in farms. About 70 percent of this pasture land not in farms is publicly owned and 30 percent is privately owned. Nearly all this land is in the western half of the country and consists of range, mostly native short-grass and bunch-grass vegetation adapted to the semiarid or arid conditions. In addition, much forest and woodland (over one-half) is grazed, particularly in much of the West and portions of the South, where the forest is rather open, permitting sunlight to reach the soil. The carrying capacity of this woodland pasture, like that of range pasture, is generally low. The 53 million acres of land used for nonagricultural and nonforest purposes is small, but its value is great, particularly the urban land. Finally, there are about 77 million acres of absolute desert, bare rock, certain marsh lands, and coastal beaches which are now valued at almost nothing, but have a social utility for wildlife and recreational use.

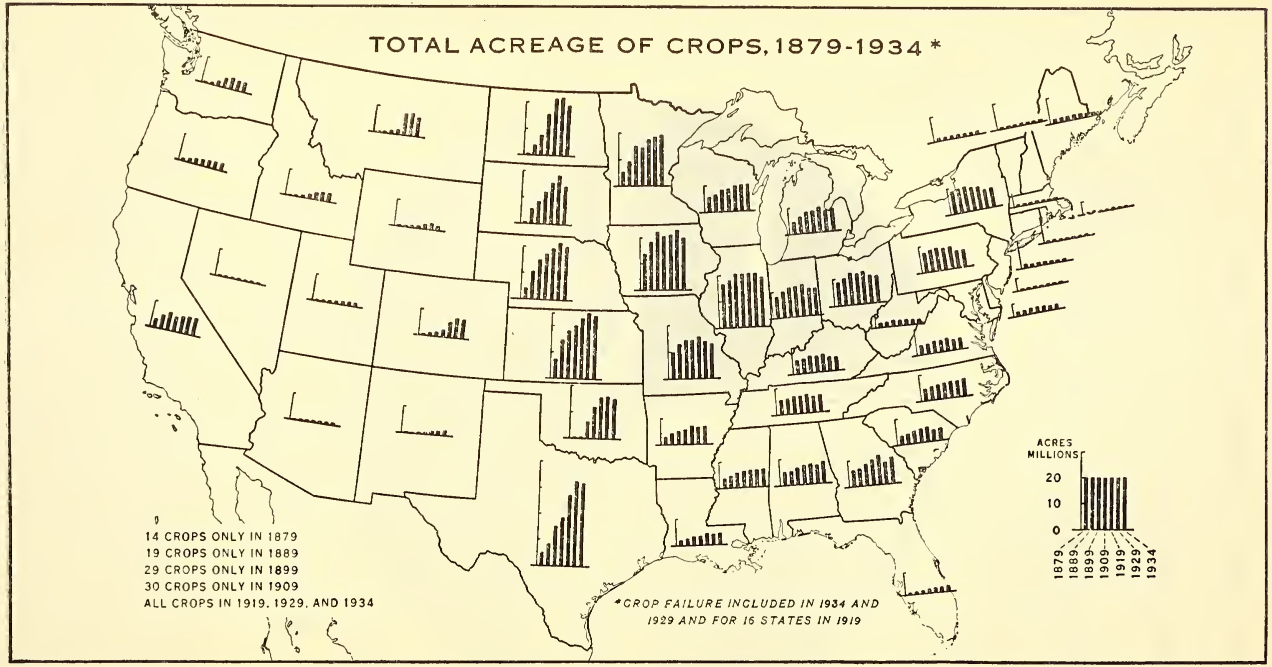
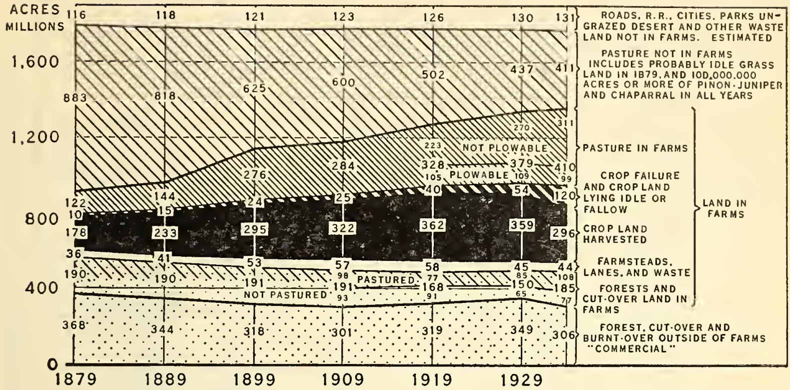


FIGURE 58.—The maximum acreage in crops was reached about 1880 in most of the New England States, except Maine, where the crest was reached about 1910; but in New York, New Jersey, Pennsylvania, Maryland, and West Virginia the crest was not reached until about 1900. In Ohio, Michigan, Indiana, Illinois, Missouri, Kentucky, Tennessee, Virginia, South Carolina, and Georgia the maximum acreage was attained about 1920. In Iowa and the Great Plains States from Texas to the Dakotas, crop acreage continued to expand until about 1930. In California and Florida, in Alabama, Mississippi and Louisiana, in North Carolina, in Wisconsin, and in Minnesota, it appears that crop acreage was still expanding in 1934. The acreage of the crops omitted in 1909 and earlier census reports was small, and probably would not have increased the total acreage more than a few percent, except in California, Florida, and New York. The States for which crop failure was included in 1919 were mostly in the Great Plains region, where such acreage is often large.

THE TREND IN LAND UTILIZATION
United States, 1879-1934



* FIGURES PRIOR TO 1929 ARE MOSTLY ESTIMATES BASED ON THE CENSUS

FIGURE 59.—The agricultural conquest of the continent is over. Although there is about as much potentially tillable land still available as that now tilled, this land is mostly too dry or too wet, too steep, stony or sandy, or eroded, to cultivate profitably under present conditions, or those likely to arise in the future. Between 1879 and 1919 the acreage of crops harvested doubled, but between 1919 and 1929 it decreased 3 million acres—the first decrease recorded by a decennial census—and between 1929 and 1934 it decreased 63,000,000 acres owing principally to drought. A rapid increase in crop failure and in crop land lying idle or fallow may be noted, and the inclusion of much former range land within the farm-pasture acreage

AGRICULTURAL PRODUCTION, CROPS HARVESTED, FARM LABOR, AND POPULATION, 1897-1935

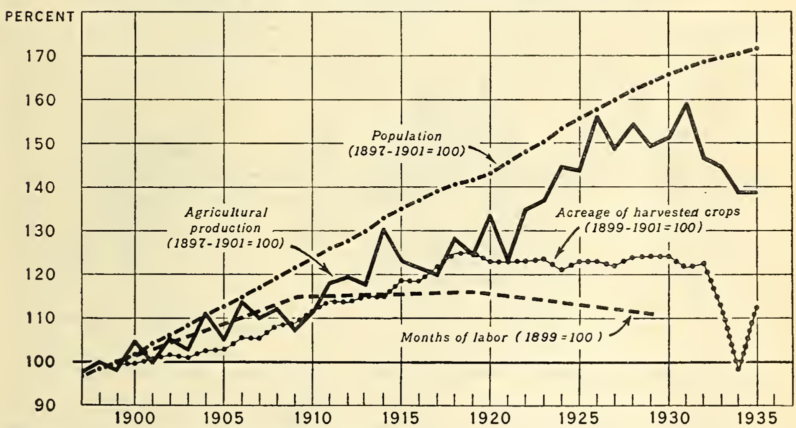


FIGURE 60.—Agricultural production from 1926 to 1931 was about 50 percent greater than at the beginning of the twentieth century, crop acreage was nearly 25 percent greater, and quantity of labor employed in agriculture in 1929 was 10 to 12 percent greater. Production per acre, therefore, increased about 20 percent, and production per man about 35 percent. Most of this increase occurred after the World War. The trend of production has been rapidly downward since 1931, due largely to exceptional drought. The base period 1897–1901 was opulent in the relation of production to population, about one-fourth of the production being exported, as compared with less than one-eighth at present. Consumption per capita has declined only slightly.

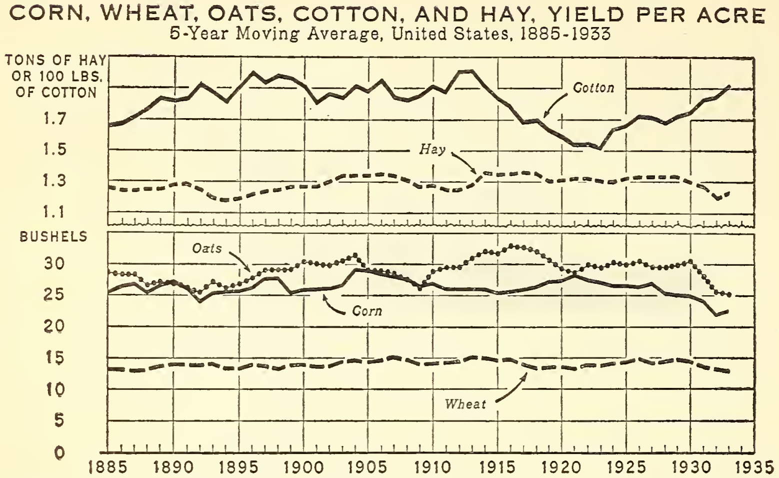


FIGURE 61.—The future need for farm land depends in part upon crop yields per acre. The acre yields of wheat in the United States as a whole have changed little for 30 years, except for an occasional abnormal year. The acre yields of corn have trended downward during the last decade and a half. During the last 5 years acre yields averaged lower than in any preceding 5 years, certainly since the Civil War. The acre yields of oats have been fairly well maintained, except during the recent drought years. The acre yields of cotton trended downward as the boll weevil extended its ravages, but in 1931, 1933, and 1935 were notably high. The average acre yield of hay increased, prior to 1930, largely because of shifts from the less productive grasses to the more productive legumes.

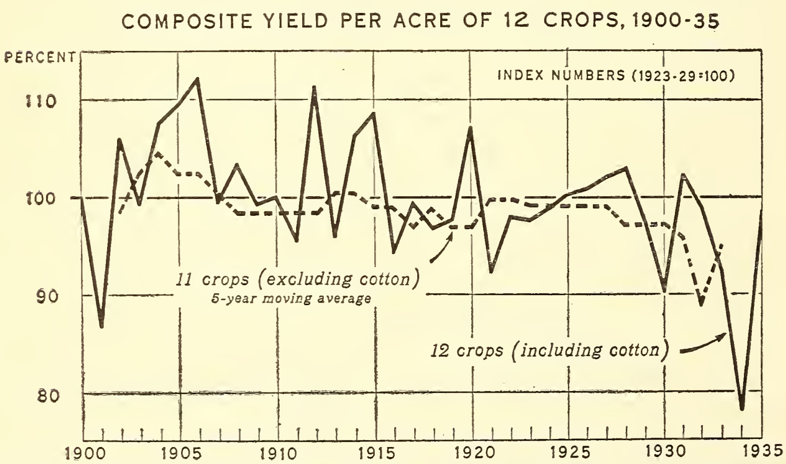


FIGURE 62.—Average acre yields were higher in the first 15 years of the century than during the years 1916–31. Over the latter period, however, aside from year-to-year fluctuations, the trend was almost horizontal, and when cotton is eliminated from the crops, the change is small during the entire third of the century. Recent drought years, of course, have greatly depressed yields; and owing to soil erosion and depletion of organic matter (humus) in the soil, it is possible that complete recovery of crop yields to the pre-war level will not occur. With reference to pastures, the available evidence indicates an average decline of fully 10 percent in carrying capacity during the decade preceding the economic depression.

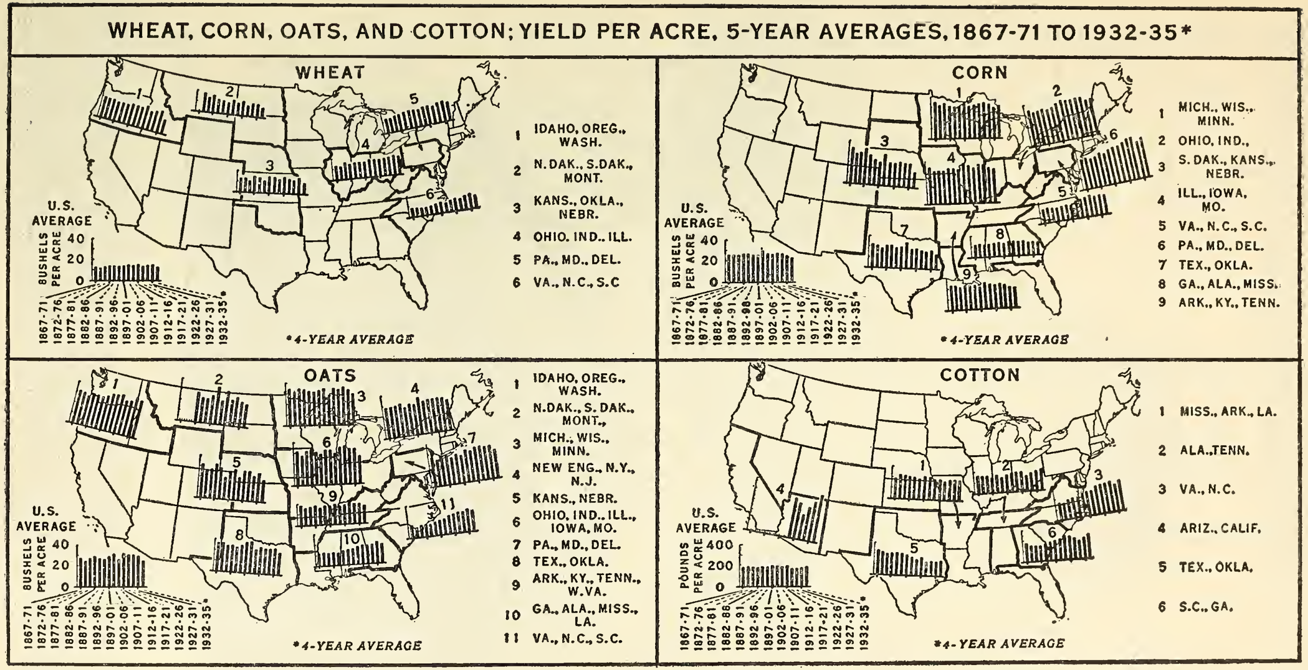


FIGURE 63.—The trend in acre yields of wheat has been upward in the Atlantic Coast States, where fertilizers have become widely used, also in the eastern Corn Belt; but downward in the Great Plains States. This is partly attributable to expansion of acreage onto drier lands, partly to droughts in recent years. The acre yields of corn trended upward until recently in the southern and central Atlantic Coast States, also in the eastern and central Corn Belt States. But in the Great Plains States the trend has been downward, as with wheat, and probably for the same reasons. In the South Central States the trend also appears to be downward, perhaps owing in part to the accumulating effects of erosion. Acre yields of cats have been generally well maintained until recent years. Cotton yields per acre trended downward in Texas and Oklahoma until the World War and have since remained about stationary. In the eastern portion of the Cotton Belt the trend has been upward for 15 years despite the boll weevil.

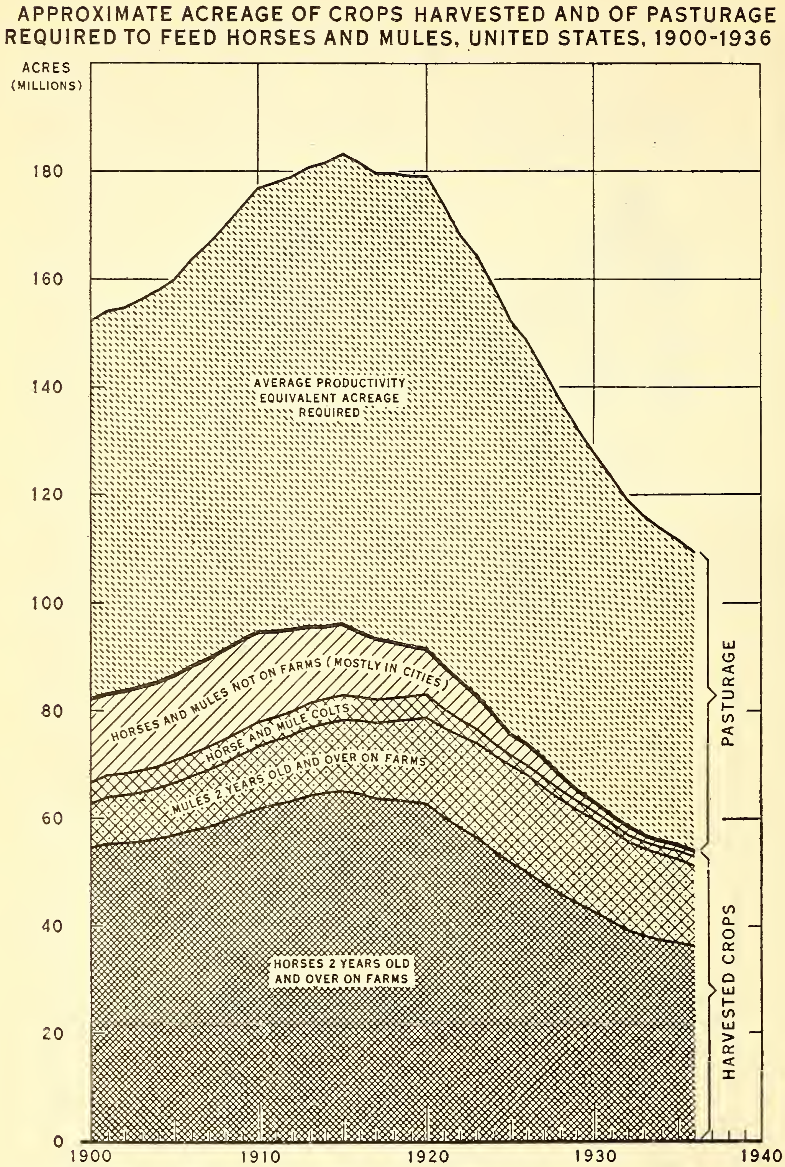


FIGURE 64.—The need for agricultural land has been greatly affected in recent years by the decline in horses and mules. The area of crops required to feed horses and mules on farms, in cities and elsewhere reached a peak of 96,000,000 acres, more or less, in about 1915. In addition, nearly 90,000,000 acres of pasture lands of average carrying capacity (humid climate) were required. Then, as automobiles and tractors increased, horses and mules declined in number, until in 1936 only about 54,000,000 acres of crops and 55,000,000 acres of average pasture were required. The total area of crops harvested in 1915 was about 352,000,000 acres and in 1935 about 332,000,000 acres. The production of animal power required, therefore, about 27 percent of the total crop acreage in 1915 and 16 percent in 1935. (The acreage estimates are based on estimates of feed requirements per horse and mule provided by R. D. Jennings, Bureau of Agricultural Economics.)

LESS PRODUCTIVE COMPARED WITH MORE PRODUCTIVE CROPS PER ACRE AND MEAT AND MILK ANIMALS PER UNIT OF FEED CONSUMED

Percentage Change in Acreage or Number, since 1900

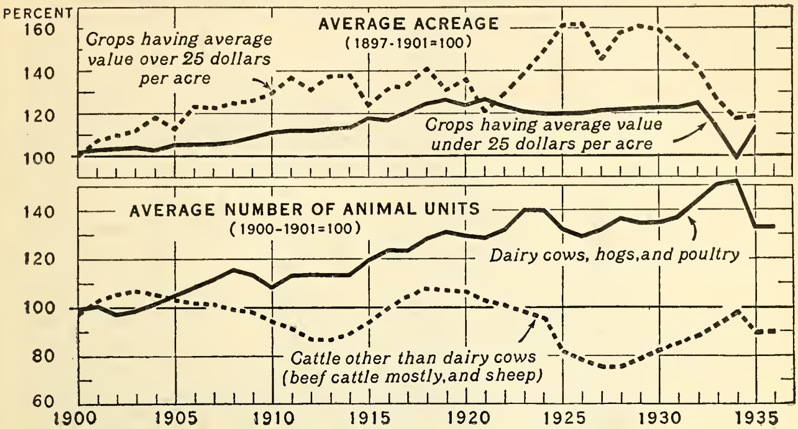


FIGURE 65.—Shifts from the less-productive toward the more productive crops per acre have affected the need for agricultural land. The acreage of crops having a high average value per acre (over $25 during the period 1925–29) increased more rapidly prior to the depression than that of crops having a lower average acre value. From 1921 to 1926 the increase in acreage of the more valuable crops was notable. Likewise the number of dairy cows increased notably while that of beef cattle, which produce much less human food per unit of feed consumed (fig. 69), has declined slightly, after allowance is made for the cycle. But during the depression, and with the development of the program of the Agricultural Adjustment Administration, the trend has been toward the less intensive use of the land.

BIRTH RATES: FIVE COUNTRIES OF NORTHWESTERN EUROPE, 1870-1935

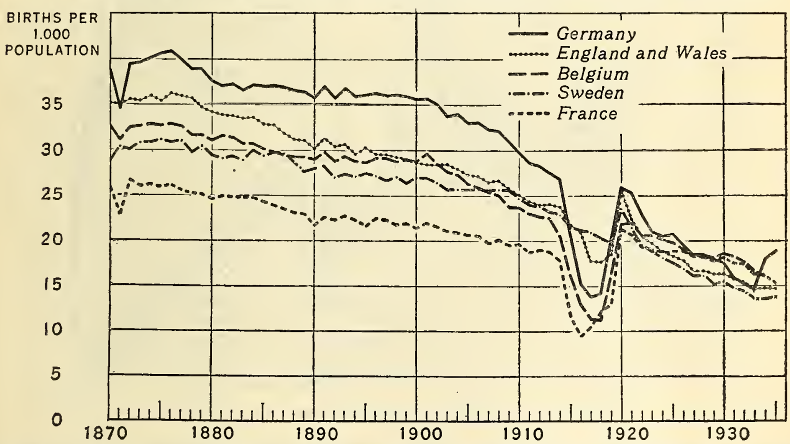


FIGURE 66.—Birth rates are declining in northwestern Europe, which has hitherto provided the principal export market for American farm products. The marked decrease in birth rates in these countries in the years of the World War was merely a dislocation in an otherwise steadily declining trend. This tendency is occurring wherever industrialism and urbanization are important. In Great Britain, for example, the population will reach a maximum in about 1940, and after a few years will begin to decline, slowly at first, but increasing in speed with the passage of time, unless there is unprecedented immigration. Since 10 adults are raising only about 7 children, Great Britain in a century will have about one-third of the present population, unless the birth rate rises or there is immigration from abroad.

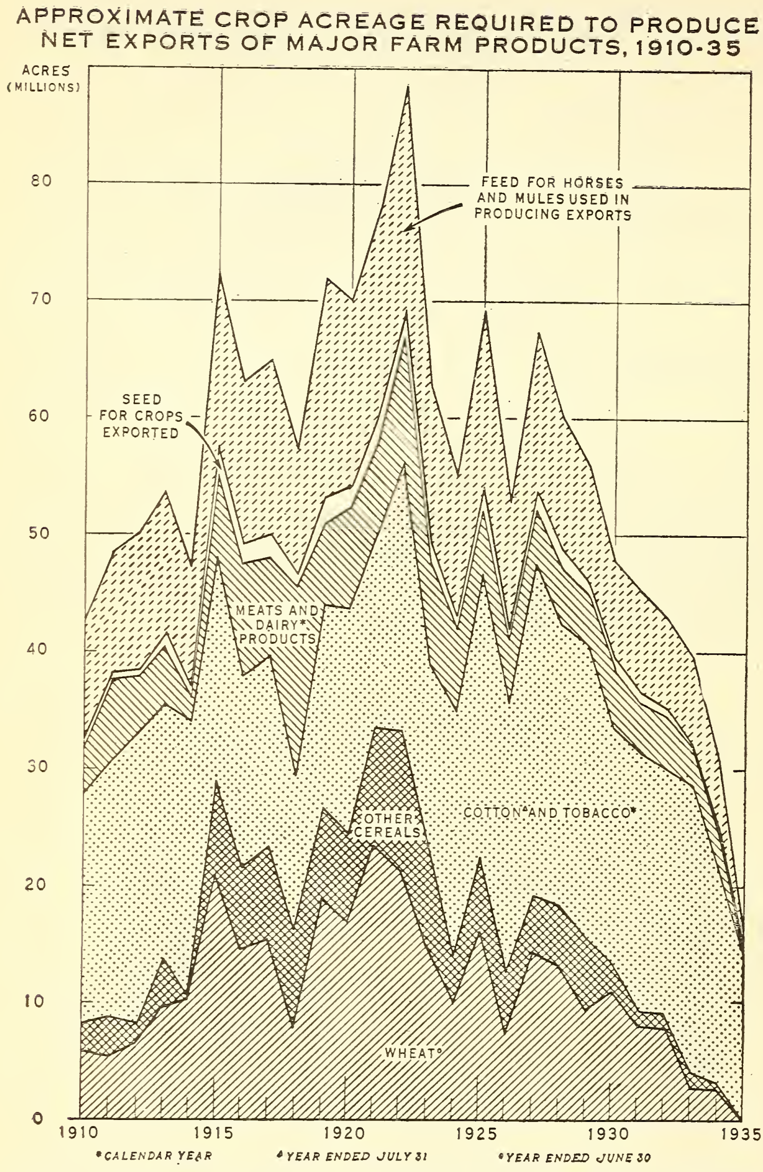


FIGURE 67.—The acreage required to produce the net agricultural exports from the United States reached a peak about the beginning of the century and again during the years 1919–22. From the high point of over 80 million acres in 1921–22 the area declined to less than 20 mil ion acres in 1934–35. Cotton, including the estimated acreage needed to grow the feed for horses and mules used in its production, required one-half to three-fourths of the total acreage during the years 1924–32. In 1934–35 cotton and tobacco were almost the only major farm products of which the exports exceeded the imports. This was in part due to the drought which greatly reduced the production of wheat and other cereals, of beef and pork and, to a less extent, of dairy products. Acreages are calculated on acre yields of the crop during the preceding year.

CHANGES IN PER-CAPITA CONSUMPTION OF SIX MAJOR FOODS, UNITED STATES, 1909-10 TO 1935-36

INDEX NUMBERS (1909-10 TO 1913-14=100)

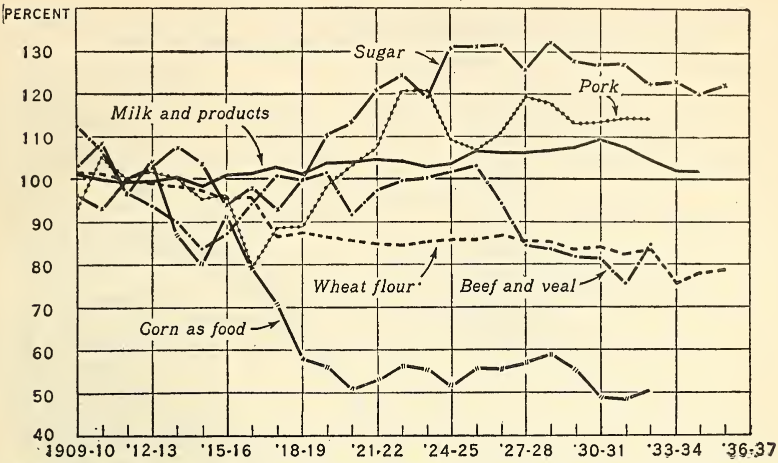
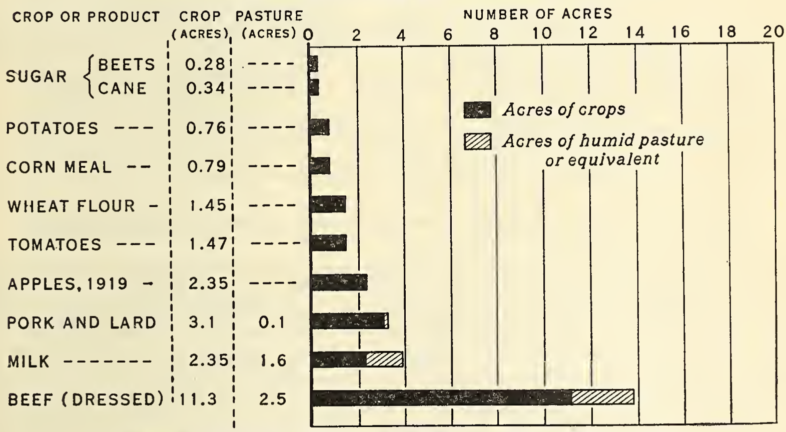


FIGURE 68.—The need for farm land may be greatly affected by the diet of the people. Notable changes in diet occurred during and after the World War. The per capita consumption of corn for human food apparently dropped one-half between 1911 and 1920, and of wheat about one-seventh, mostly between 1917 and 1918. The per capita consumption of sugar increased one-third between 1918 and 1924 and of pork and lard about one-fourth between 1918 and 1923. The curve for beef and veal shows a downward trend, but the per capita consumption of milk and dairy products has been well maintained. Combining all the foods, it appears that there has been a slight downward trend since 1928. The meat and milk estimates are preliminary.

ACRES OF CROP LAND AND PASTURE USED TO PRODUCE THE YEARLY REQUIREMENT PER PERSON* OF CERTAIN FOODS

UNITED STATES, 1922-24



*THE YEARLY CONSUMPTION OF FOOD PER PERSON AVERAGES 1,400,000 CALORIES

FIGURE 69.—One-third of an acre in sugar crops produces about as many calories of food as three-fourths of an acre of potatoes or corn, or 1½ acres of wheat or tomatoes. But, lacking protein and fat, a person could not live on sugar alone. The cereal diet would maintain health much longer. To maintain health permanently meat, milk, or other foods high in protein, fat, and vitamins should be added. These require 3 to 4 acres of crops and pasture to yield the same energy value in pork or milk, or 12 to 14 acres devoted to beef production. In explanation of the title, the yearly per capita disappearance of foodstuffs in the United States is about 1,400,000 calories. Figures used in preparing the chart are preliminary.

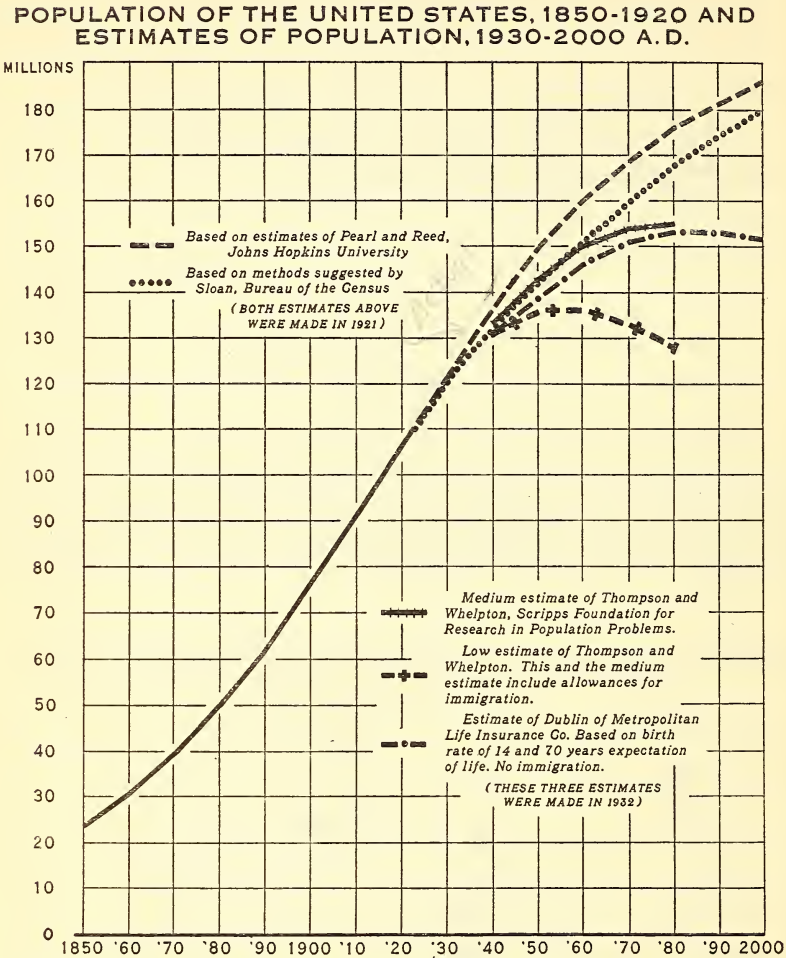


FIGURE 70.—In 1921, Pearl and Reed, projecting population trends on the basis of a logistic curve, estimated that the population of the United States would be about 190,000,000 by the year 2,000, and would increase slowly for several decades thereafter. But births began to decline in 1922, and by 1932 an estimate made by Dublin, also the "medium" estimate of Thompson and Whelpton, indicated that the population of the United States probably would never exceed 156,000,000 and that the stationary condition would be reached about 1980. The Thompson and Whelpton "minimum" estimate indicated a maximum population of 136,000,000 about 1956. This "minimum" estimate appears now the safest. Should the average decrease of 50,000 in number of births each year during the past decade continue, and should immigration be balanced by emigration, the population will reach a maximum in about 1950, and then begin to decline. But the decline will be slow for a decade or more. The prospect is that the population of the Nation will not diverge more than 10 percent from the present number within the next 25 years. The natural resources of the Nation have been depleted probably not more than 5 percent during the last 10 years—though soil erosion losses have been enormous. The human resources, as measured by number of births, have declined 20 percent during the decade. However, the birth rate tends to be highest where soil erosion is most rapid. In such regions the pressure of population on the land may become increasingly severe, while the population of the Nation as a whole declines.

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